Solid and Hazardous Wastes Management Report for the Draft Environmental Impact Statement for the Mandan, Hidatsa, and Arikara Nation's Proposed Clean Fuels Refinery Project

U.S. Environmental Protection Agency

Draft

June 14, 2006

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Portions of this document were prepared by Greystone Environmental Consultants, Inc. in consultation with Triad Project Corporation and modified by EPA. The information in this document is preliminary, subject to revision and is intended to supplement information provided in the Draft Environmental Impact Statement (EIS).

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Chapter 1 — Introduction

On July 22, 2003, the MHA Nation purchased three tracts of land on the Fort Berthold Indian Reservation (Reservation) in North Dakota. These tracts, which are in the northeast corner of the Reservation and in Ward County, include:

- the NW ¼ of Section 20, Township 152 North, Range 87 West (Tract 1);
- the North ½ of Section 19, Township 152 North, Range 87 West (Tract 2); and
- Outlot 1 in the NE ¼ of Section 19, Township 152 North, Range 87 West (Tract 3).

Taken together as a single parcel, these tracts encompass almost 469 acres (see draft EIS Chapter 1 for a site location map). Following the purchase, MHA Nation requested that the Bureau of Indian Affairs (BIA) accept the tracts into trust status. The Indian Reorganization Act of 1934 (IRA) authorizes the Secretary of the Interior to hold land for Indian Tribes and individual Indians in trust.

The MHA Nation proposes to construct, operate, and maintain a grassroots, clean fuels refinery on 190 acres of the 469-acre parcel. The MHA Nation would own the refinery. Second, the MHA Nation would grow feed for its herd of buffalo on the other 279 acres.

The purpose of this report is to describe and evaluate the projected generation, management, and disposal of hazardous and solid wastes associated with the proposed refinery. This report describes the refinery processes that will use or generate hazardous and solid wastes and identifies those wastes. The report discusses the regulatory requirements for hazardous and solid wastes and some of the potential impacts to human health and the environment associated with such wastes.

Although non-hazardous wastes are identified, the focus of the evaluation is on solid waste designated as a hazardous waste (listed RCRA hazardous wastes) and those wastes that may be hazardous waste based on testing for specific waste characteristics (for example, RCRA characteristic wastes). In the case of the latter, testing or knowledge of the hazard characteristics of the waste are required to determine whether they are a hazardous waste.

Chapter 2 - Applicable Requirements

The applicable federal hazardous and solid waste regulatory requirements that would apply to the MHA Nation's proposed refinery are discussed in general terms below. These federal requirements implement the Resource Conservation and Recovery Act (RCRA).

The United States Environmental Protection Agency (EPA) Region 8 is responsible for oversight and implementation of RCRA Subtitle C programs on Indian country lands, including on the Fort Berthold Indian Reservation (Reservation). EPA has not approved the State of North Dakota to implement RCRA programs on the Reservation.

The RCRA hazardous waste regulations established pursuant to Subtitle C of RCRA identify three categories of hazardous waste generators: large quantity generators (LQGs), small quantity generators (SQGs), and conditionally exempt small quantity generators (CESQGs) (U. S. Environmental Protection Agency 2005f). These classifications are based upon the amount of waste generated. The volume of hazardous waste produced by each generator would determine with which parts of the RCRA regulations that the generator must comply under 40 CFR Part 262. An evaluation of the hazardous waste generated at the MHA refinery will determine its generator classification and compliance requirements.

RCRA Subtitle C generally requires that anyone who owns or operates a facility where hazardous waste will be treated, stored, or disposed (as defined by RCRA) to have a RCRA hazardous waste permit. The types and amounts of hazardous waste expected to be generated at the MHA refinery, methods of treatment, storage and disposal, and potential hazardous waste exclusions, were evaluated to determine whether a RCRA permit would be required for the refinery. A RCRA Subtitle C treatment, storage or disposal permit would significantly increase the regulatory burden on the facility. The requirements for RCRA permits are found at 40 CFR Parts 124, 264, and 270. These requirements include proper design and operation, monitoring, financial assurance, closure and post-closure care, and corrective action.

RCRA regulations established pursuant to Subtitle D of RCRA specify criteria for solid waste disposal facilities and practices. The regulations are self-implementing. Any facility or practice not meeting the criteria in RCRA Subtitle D, or approved alternate criteria can be subject to enforcement. EPA does have current authority to issue federal RCRA Subtitle D solid waste permits, including in Indian country. RCRA does not contain any express provision authorizing EPA to treat tribes in a similar manner as states for purposes of implementing RCRA programs. Tribes may, under their own sovereign authority, implement Tribal solid waste programs. The MHA Nation currently does not have a Tribal solid waste code or program in place, but could develop a regulatory program to control land application of treated wastewater through Tribal solid waste or groundwater programs.

Other environmental program requirements may also apply. These requirements include requirements under CWA (NPDES), and SDWA (UIC).

Chapter 3 — Project Description and Equipment Specifications

The proposed refinery would consist of primary (separation) and secondary (upgrading) process units to produce finished products for consumer use. These products would include:

- Propane and butane
- Reformulated gasoline
- Jet fuel
- Summer diesel
- Winter diesel
- Bio-diesel
- Liquid sulfur
- Residual oil

The processes used to generate and treat these products at the refinery would include:

- Atmospheric distillation
- Saturate gas recovery
- Naphtha reformulating
- Steam methane reformulating (hydrogen plant)
- Sulfur recovery
- Distillate desulfurizing
- Hydrocracking
- Butane feed treatment
- Deisobutanizing
- Butane isomerization
- Isobutane dehydrogenation
- Iso-octane
    - Isobutylene dimerization
    - Iso-octene hydrogenation
- Oilseed extrusion (potential future)
- Bio-diesel reactor (potential future)
- Flaring

Process Description

The proposed facility would be a 10,000-barrel per stream day (BPSD) complex grassroots clean fuels petroleum refinery, feeding synthetic crude piped in from northern Alberta. In addition, the refinery would receive 3,000 BPSD of field butanes and 6 MMSCFD of natural gas. A simplified process flow diagram for the refinery is provided in Chapter 2 of the draft EIS. The throughput capacities for the major components of the refinery are presented on Table 3-1 and the estimated utility consumptions are shown on Table 3-2. A listing of the storage tanks to be used for the storage of feedstocks, intermediates, chemical additions, and blending stocks is presented on Table 3-3.

Table 3-1 MHA Nation Refinery Nominal Process Throughput Capacities

	Nominal Throughput Capacity		
Unit	(BPSD)[1]	(MMSCFD)[1]	(MTD)[1]
01 – Crude	10,000		
04 – Naphtha Hydrotreater/Catalytic Reformer	3,000		
08 – Hydroprocessor (Hydrodesulfurization, Hydrocracking and Franctionation)	6,000		
12 – Butamer	3,000		
14 – InAlk Isooctene/Hydrogenation	5,500		
16 – Butane Dehydrogenation	5,500		
20 – Butane Feed Preparation and Deisobutanizer	3,000		
24 – Hydrogen		6	
28 – Sulfur			3

Note:
1. BPSD = barrels per stream day, MMSCFD = million standard cubic feet per day, MTD = metric tons per day.

Table 3-2 MHA Nation Refinery Utility Consumption Estimates

	Consumption		
Utility	(MW)[1]	(MMSCFD)[1]	(gpm)[1]
Electricity	7		
Natural Gas		6	
Water			40

Note:
1. MW = megawatts, MMSCFD = million standard cubic feet per day, gpm = gallons per minute.

The purpose of petroleum refining is to separate crude oil into desired different components for sale, such as gasoline and diesel fuels. Crude oil is composed of a mixture of many different types of chemical compounds, which are accompanied by smaller amounts of impurities. Most of the chemical compounds are hydrocarbons. The refinery process breaks this mixture of hydrocarbon compounds into a number of other more useable mixtures of compounds.

Table 3-3 MHA Nation Refinery Storage Tanks

	Tank		
Content of Tank	Number	Type	Nominal Size (bbl)
Raw Crude	2	Floating roof	40,000
Raw Heavy Diesel	1	Fixed roof	8,000
Raw Light Diesel	1	Fixed roof	8,000
Raw AGO	1	Fixed roof	8,000
Raw Heavy	1	Fixed roof	5,000
Raw Light	1	Fixed roof	5,000
Light Slop	1	Floating roof	5,000
Heavy Slop	1	Fixed roof	5,000
Hydrocrackate	1	Floating roof	5,000
Treated Naphtha	1	Floating roof	5,000
Ethanol	1	Floating roof	5,000
Alkylate	1	Floating roof	10,000
Reformate	1	Floating roof	10,000
Bio-Diesel	1	Floating roof	10,000
Regular Unleaded	2	Floating roof	25,000
Premium Unleaded	1	Floating roof	25,000
Off-Road Gasoline	1	Floating roof	1,500
Middle Distillate	4	Floating roof	50,000
Field Butane	4	Pressure vessel	1,000
Propane	4	Pressure vessel	500
Fresh Caustic Tank[1]	1	Fixed roof	1,500
Sour Water Storage Tank[2]	1	Fixed roof	1,500
Amine Make-up Storage Tank[2]	1	Fixed roof	1,500

Notes:
1. Butane isomerization unit.
2. Sulfur/amine unit (sour water stripper).

A summary of the feedstocks, products, catalysts, and major chemicals identified to be used for each unit of the refinery is shown on Table 3-4. Additional information on the major chemicals and catalysts used in the refinery processes is presented on Table 3-5 and Table 3-6, respectively.

Table 3-4 MHA Nation Refinery Summary of Feedstocks, Products, Catalysts, and Chemicals

Process	Feedstocks Used in the Process	Products Produced	Catalysts Used in the Process	Chemicals Used in the Process
Unit 01 – Crude Unit/Saturated Gas Plant	Synthetic crude oil	Gas, Gas Oil, Distillate, Residue, Atmospheric Reduced Crude, Propane, Butane		Caustic Solution, Corrosion Inhibitor
Unit 04 – Naphtha Hydrotreater/Catalytic Reformer	Sulfur-containing Naphtha, Stabilized Naphtha	High-Octane Gasoline Blending Component (Reformate)	Hydrotreating (120) Reforming (R-86)	Perchloroethylene, Dimethyl Disulfide, Caustic Solution
Unit 08 – Hydroprocessor (Hydrodesulfurization, Hydrocracking & Fractionation)	Sulfur-containing Heavy Feedstock (Gas, Oil Diesel)	Light & Heavy Ultra-Low Sulfur Diesel Fuels, Heavy Hydrocrackate (feedstock to Unit 04 reformer)	Hydrocracking (TK-10, TK-711, N-204, HC-215) Hydrotreating (UF 210 STARS)	Unicor M Corrison Inhibitor, Unicor LHS Corrosion Inhibitor, Rock Salt, Sodium Ash & Sodium Nitrate Solution, Dimethyl Disulfide, Flushing Oil, Caustic Solution, HCL Acid Solution
Unit 10 – Bio-Diesel	Facility will not be initially constructed; bio-diesel will be purchased for blending			
Unit 12 – Butamer	Normal Butane and Mixed Butanes (iso and normal)	Isobutane conversion to Isobutene	Butane to Iso-Butane Conversion (I-120) Molecular Sieve Drying for butane and makeup gas (UOP Type 9453, UOP Type 9131, UOP Type 9413)	Caustic Solution, Carbon Tetrachloride, Sodium Hydroxide, Anhydrous HCL Acid
Unit 14 – InAlk Isooctene + Hydrogenation	Iso-butene	Iso-Octane for a blending component of gasoline	Hydrogenation (UOP-S100) Olefin Polymerization & Nbutane Conversion UOP-SPA	None
Unit 16 – Oleflix (Butane Dehydrogenation)	Isobutane	Isobutylene	Dehydrogenation (DeH-14)	Chlorine, Perchloroethylene, Dimethyl Disulfide, Caustic Solution (10%)
Unit 20 – Butane Feed Preparation & Deisobutanizer	Isobutane OH and Makeup Isobutane	NButane, Isobutane	Hydrotreating (UF 210 STARS)	Perchloroethylene, DimethylDisulfide, Caustic Solution
Unit 24 – Hydrogen Plant	Natural gas, Fuel Gas	Hydrogen	Hydrogenation (TK-550) Chlorine-Guard (HTG-1) Desulphurization (HTZ-3, ST-101) Pre-reformer (RKNGR) Reformer (R-67-7H) High Temperature Shift Converter (SK-201-2) Low temperature Shift Converter (LSK, LK-823) Support Media (Alumina Balls, Ceramic Balls)	None

Table 3-4 MHA Nation Refinery Summary of Feedstocks, Products, Catalysts, and Chemicals

Process	Feedstocks Used in the Process	Products Produced	Catalysts Used in the Process	Chemicals Used in the Process
Unit 28 – Sulfur/Amine	Sour water, Sour Gas, Field Butanes, Mixed Butanes & Propane from SAT Gas Plant	Propane, Molten Sulfur, Disulfide Oil	Spent Propane Dryers, Molecular Sieves, Claus Catalyst , Tail Gas Catalyst, Merox WS Catalyst	Caustic Solution, Sodium Hydroxide
Unit 32 – Utilities	N/A[1]	N/A	N/A	Ion Exchange Resin, Air Drier Desiccant, Oxygen Scavenger
Unit 36 – Water Treatment [Water Recycle and Waste water Treatment]	N/A	N/A	N/A	Flocculants, Acid, Caustic Solution, Lime
Unit 40 – Storage, Blending and Shipping	N/A	N/A	N/A	Red Dye, Orange Dye, Purple Dye, Cetane Improver, Gasoline Additive Package

Note:
1. N/A = Not applicable.

Table 3-5 MHA Nation Refinery — Chemicals to be Used

Unit/Chemical	Quantity Used	Purpose	Type Of Container[1]
Unit 04 Naphtha Hydrotreater & Catalytic Reformer			
Caustic Solution	2 gpm	Scrub vent gas	Atmospheric tank
Perchloroethylene	Perchloroethylene of feed caustic solution continuously injected into reformer at 1 wppm	Chloride reformer catalyst	55 gal. drums
Dimethyl Disulfide (DMDS)	900 lbs required for startup	NHT Catalyst sulfiding agent	55 gal. drums
Unit 08 – Hydroprocessor Unicracker Fractionation Section			
Rock Salt	4 m^3 for initial charge [5 m^3 for one year supply]	Drier in Fractionation section	Bulk?
Unicor M Corrison Inhibitor	330 kg/yr [Injection rate of 4.5 ppm by wt]	Stripper OH Corrosion inhibitor	55 gal. drums
Unicor LHS Corrosion Inhibitor	80 kg/yr [Injection rate of 3.0 ppm by wt]	Debutanizer OH Corrosion inhibitor	55 gal. drums
Unit 08 – Hydroprocessor Unicracker Reactor Section			
Sodium Ash & Sodium Nitrate Solution	2,000 kg of Na_2CO_3 with 500 maximum chloride and 210 kg of $NaNo_3$ [40 m^3 of aqueous soda ash neutralizing solution required for neutralization] Quantity is required to fill the reactor and the subsequent reuse of the solution to neutralize all remaining equipment.	Neutralization of Equipment	55 gal. drums
Dimethyl Disulfide	4,300 kg for initial startup sulfiding	Catalyst sulfiding during startup	55 gal. drums
Flushing Oil	2,40 m^3 of startup oil [straight run middle distillate]	Startup and/or shutdown operations	55 gal. drums
Caustic Solution	130,000 kg 10% caustic solution	Regeneration of catalyst	Atmospheric tank
Hydrochloric Acid	1,050 lbs of bottled anhydrous hydrochloric acid	Mill scale removal of selected equipment and piping prior to startup; at discretion of owner	Atmospheric tank
Unit 08 – Hydroprocessor Distillate Hydrotreating Section			
Soda Ash & Sodium Nitrate Solution	2,350 lb of Na_2Co_3 with 500 ppm maximum chloride, and 230 lb of $NaCO_3$ [5,400 aquesous soda ash solution required for neutralization]	Neutralization of reactor and equipment	55 gal. drums
Dimethyl Sulfide	3,500 lb for initial sulfiding of hydrotreating catalyst; no additional amount needed during operation.	Sulfiding of hydrotreating catalyst	55 gal. drums
Unicor LHS	One 55 gallon drum/2 yrs [Injection rate of 2 wt% ppm adequate for two years] 397 lbs net/55 gal drum	Corrosion Inhibitor for stripper OH system	Non-returnable 55 gal steel drums
HCL Acid	1,050 lbs of bottled anhydrous hydrochloric acid	Mill scale removal of selected equipment and piping prior to startup; at discretion of owner	5 gal. bottles

Table 3-5 MHA Nation Refinery — Chemicals to be Used

Unit/Chemical	Quantity Used	Purpose	Type Of Container[1]
Unit 12 – Butamer			
Caustic Solution	5 gallons per week	Caustic Degasser [Spent caustic solution/neutralization]	[Spent caustic solution/ neutralization pit]
Carbon Tetrachloride	3,380 Gals (44,660 lbs) for one fill of chloride injection drum; quantity lasts 9.5 months	Chloride Injection	container
Sodium Hydroxide	280 ft^3 of 10% wt sodium hydroxide solution for initial filling of scrubber; refilling required weekly	Net Gas Scrubber	55 gal. drums
Anhhydrous Hydrochloric Acid Solution	1,050 lbs of bottled anhydrous hydrochloric acid	Removal of residual iron oxide from equipment during startup	5 gal. bottles
Chlorine (as Cl_2) in solution	9.7 kg/day	Chloride catalyst	chemical container
Perchloroethylene	55 kg/dsy	Chloride catalyst	55 gal. drums
Dimethyl Disulfide (DMDS)	26.5 kg/day	Sulfiding of catalyst during startup	55 gal. drums
Unit 16 – Oleflex			
Chlorine (as Cl_2)	9.7 kg/day	Chloride catalyst	chemical container
Perchloroethylene	55 kg/dsy	Chloride catalyst	55 gal. drums
Dimethyl Disulfide (DMDS)	26.5 kg/day	Continuous sulfiding of catalyst	55 gal. drums
Caustic Solution (10%)	1 m^3/day	Removal of H_2S	Atmospheric tank
Unit 28 – Sulfur Plant			
Merox Caustic Solution	10 gpm	Removal of mercaptans	Atmospheric tank

Note:

1. Drums, bottles, and contains refer to the containers in which the material is shipped and stored. The atmospheric tank and spent caustic solution/neutralization pit are process vessels that contain the referenced chemicals.

Table 3-6 MHA Nation Refinery Catalyst and Molecular Sieve Properties

Catalyst/ Molecular Sieve	Manufacturer	Description	Process Used In	Primary Ingredients	Volume	Life (Years)[a]
R-86	UOP	Naphtha reforming catalyst; upgrades naphtha in presence of H_2	Unit 4 – Naphtha Hydrotreater/Catalytic Reformer	Platinum 0.25 wt. % Rhenium 0.40 wt.%	350 ft^3 (19,250 lbs)	4
S-120	UOP	Naphtha Desulfurization	Unit 4 – Naphtha Hydrotreater/Catalytic Reformer	Cobalt Molybdenum Nickel	88 ft^3	4
TK-10	UOP	Hydroprocessing Catalyst	Unit 8 - Hydroprocessor	Al2O3 65-75 %w/w MgO 25-35%w/w	0.3 m^3	3
TK-711	UOP	Hydroprocessing Catalyst	Unit 8 - Hydroprocessor	NiO 1-3 %w/w MoO3 4-8 %w/w Al2O3 80-90 %w/w	1.0 m^3	3
N-204	UOP	Hydroprocessing Catalyst 1/10” 1/20”	Unit 8 - Hydroprocessor	NiO 1-3 %w/w MoO3 4-8 %w/w Al2O3 80-90 %w/w	1.0 m^3 4.0 m^3	3
HC-215	UOP	Distillate-selective hydrocracking catalyst	Unit 8 - Hydroprocessor	NiO 1-3 %w/w MoO3 4-8 %w/w Al2O3 80-90 %w/w	15 m^3	3
UF210 STARS	UOP	Distillate Hydrotreating Catalyst	Unit 8 - Hydroprocessor	NiO 1-3 %w/w MoO3 4-8 %w/w Al2O3 80-90 %w/w	530 ft^3	3
I-120	UOP	Converts normal butane to iso-butane	Unit 12 – Butamer	Amorphous Chlorided Alumina Platinum	300 ft^3 (16,500 lbs)	2
Type 9453	UOP	Molecular Sieve (Butane Driers- 2)	Unit 12 – Butamer	Zeolite	726 ft^3	2
Type 9131	UOP	Molecular Sieve (Butane Driers -2)	Unit 12 – Butamer	Zeolite	50 ft^3	2
Type 9413	UOP	Molecular Sieve (Makeup Gas Drier-2)	Unit 12 – Butamer	Zeolite	12 ft^3	2
S-100	UOP	Iso-Octane Saturation	Unit 14 – InAlk Isooctene & Hydrogenation	Al2O3 95 wt% SiO2 0.02 wt% Fe2O3 0.02 wt% Na2O 0.30 wt%	600 ft^3	4
SPA	UOP	Solid phosphoric acid catalyst; produces high purity Isobutylene Dimerization	Unit 14 – InAlk Isooctene & Hydrogenation	Phosphoric Acid	750 ft^3	4
DeH-14	UOP	Dehydrogenation	Unit 16 – Oleflex (iC4 Dehydrogentaion)		884 ft^3	4
TK-550	Haldor Topsoe, Inc.	Hydrogenation	Unit 24 – Hydrogen	Cobalt Molybdenum	66 ft^3 3,650 lbs	5
HTG-1	Haldor Topsoe, Inc.	Chloride absorption	Unit 24- - Hydrogen	Al2O3 60-75%w/w K2CO3 25-40 %w/w	A-36 ft^3 2,000 lbs	1[b]

Table 3-6 MHA Nation Refinery Catalyst and Molecular Sieve Properties

Catalyst/ Molecular Sieve	Manufacturer	Description	Process Used In	Primary Ingredients	Volume	Life (Years)[a]
HTZ-3	Haldor Topsoe, Inc.	Sulfur Absorption	Unit 24 – Hydrogen	ZnO 99-100 %w/w	A-141 ft^3 7,755 lbs	¼, 3[c]
ST-101	Haldor Topsoe, Inc.	Sulfur Absorption	Unit 24 – Hydrogen	CuO 50-60 %w/w ZnO 20-30 %w/w Al2Os 5-15 %w/w	A-43 ft^3 2,400 lbs	¼, 3[c]
R-67-7H	Haldor Topsoe, Inc.	Steam reforming	Unit 24 – Hydrogen	NiO 15-20 %w/w MgO 20-25 %w/w Al2O3 55-60 %w/w	A-82 ft^3 B-10 ft^3	5
SK-201-2	Haldor Topsoe, Inc.	High Temperature Shift Conversion	Unit 24 – Hydrogen	Fe2O3 80-90 %w/w Cr2O3 8-13 %w/w CuO 1-2 %w/w	102 ft^3	3
Type 9413	UOP	PSA Molecular Sieve	Unit 24 – Hydrogen PSA	Zeolite	1,500 ft^3 80,000 lbs	2
Alumina Balls [Top and Bottom of Catalyst Bed]	Norton	Support Media Denstone 99	Unit 24 – Hydrogen	Al2O3 >99.0 wt% SiO2 <0.20 wt% TiO3 <0.3 wt% Fe2O3 <0.12 wt% CaO/MgO <0.2 wt% Na2O/K2O <0.35 wt% Cl <10 wt ppm S <10 wt ppm	2 ft^3 (350 lbs) 3 ft^3 (525 lbs) 5 ft^3 (875 lbs) 2 ft^3 (350 lbs) 4 ft^3 (700 lbs) 14 ft^3 (2450 lbs) 38 ft^3 (6650 lbs)	10
Ceramic Balls [Top and Bottom of Catalyst Bed]	Norton	Support Media Denstone 57	Unit 24 – Hydrogen	Al2O3 67.4 wt% SiO2 24.10 wt% TiO3 1.18 wt% Fe2O3 <0.10 wt% CaO/MgO ~0.90 wt% Na2/K2O ~4.46 wt%	2 ft^3 (300 lbs) 2x3 ft^3 (900 lbs) 5 ft^3 (750 lbs) 1.5 ft^3 (225 lbs) 2x2 ft^3 (600 lbs) 4 ft^3 (600 lbs) 7 ft^3 (1,050 lbs) 2x10 ft^3 (3000 lbs) 38 ft^3 (5700 lbs)	10
Claus Catalyst	UOP S–2001	Acid Gas Conversion	Unit 28 – Sulfur/Amine	TiO_2	9.4 ft^3	5
Tail Gas Catalyst	Comphino	Tail Gas Cleanup	Unit 28 - Sulfur/Amine	Cu-Ni	9.4 ft^3	5

Table 3-6 MHA Nation Refinery Catalyst and Molecular Sieve Properties

Catalyst/ Molecular Sieve	Manufacturer	Description	Process Used In	Primary Ingredients	Volume	Life (Years)[a]
Merox WS	UOP	Mercaptan treating	Unit 28 – Sulfur/Amine	Cobalt		
Molecular Sieve	CECA	Propane & Butane Driers	Unit 28 – Sulfur/.Amine	Calcium Alumina Silicate	20	8

Notes:

a. One year is calculated as 8,760 hours.

b. One year of operation on naphtha feed per reactor assuming 1 ppm wt Cl In naphtha.

c. The catalyst is expected to be changed on-line every 3 months in one of two reactors (Reactor A) assuming operation on fuel gas feed containing 100 vol ppm H2S. The second reactor, Reactor B, serves as a guard reactor. The catalyst in Reactor B is expected to be changed during shut-down every three years assuming that each replacement of catalyst in Reactor A lasts at least one week.

The composition of hydrocarbons and impurities of crude oil can vary substantially due to its origin (different natural crudes and synthetic crudes). The equipment and operations of a given refinery are designed and operated in a fashion to process the specific crude oils and produce specific products. Therefore, no two refineries are typically the same because of the composition of the crude oil and the desired final products. The MHA Nation's proposed refinery is designed to use synthetic crude oil as its basic feedstock to produce clean and efficient fuels. State of the art technologies would be used to produce clean fuels that meet existing clean fuel requirements.

The proposed refinery would be composed of eleven basic operating units that are summarized on Table 3-7. The bio-diesel unit would not initially be constructed as part of the refinery. Instead, bio-diesel would be purchased for blending at the refinery. If constructed in the future, the bio-diesel process would include extracting oil from soybeans and soy meal and producing bio-diesel fuel from the raw soy oil. Unit 28 would be associated with the sulfur recovery process and tail gas stack.

Table 3-7 Summary of Units that would Compose the Refinery

Unit	Description
01 – Crude processing	Takes the crude oil and separates it into component parts by a heating process called distillation.
04 – NHT and Reformer	Removes sulfur from naphtha feedstock and reforms the desulfurized naphtha with hydrogen to produce a high-octane gasoline blending component.
08 – Hydroprocessor	Cracks hydrocarbons into smaller, lighter ones under high temperatures, high pressures, and a hydrogen atmosphere. Produces light and heavy ultra-low sulfur diesel fuels.
10 – Bio-diesel	Processes oil from soybeans into bio-diesel (methyl esters).
12 – Butane isomerization	Catalytically converts, in the presence of hydrogen, normal butane into isobutene that is fractionated in the deisobutanizer feedstock to the isobutene dehydrogenation unit.
14 – Iso-octane	Catalytically dimerizes isobutylene from the isobutane dehydrogenation unit to form iso-octene. Next, this is saturated with hydrogen to form iso-octane, a high octane gasoline blending component.
16 – Butane Dehydrogenation	Converts isobutane to isobutylene as part of the process to produce iso-octane.
20 – Deisobutanizer	Separates isobutane, normal butane, and pentanes.
24 – Hydrogen	Produces the hydrogen needed for other refinery units.
28 – Sulfur/amine	Removes sulfur compounds from various water and gas streams and converts the removed material into elemental sulfur.
32 – Utilities	Composed of the fuel gas, flare, instrument and utility air, fire water, boiler feed water, and nitrogen systems.
36 – Water treatment	Process raw water from wells to treated water and treats waste water.
40 – Storage, blending, and shipping	Includes tanks for storing products, pumps for blending products, and facilities for loading railcars and trucks.

Source: Triad Project Corporation 2003, Woolley 2004

Utilities would consist of the following sources:

- Flare System
- Emergency Generator
- Fire Pump Engine

The refinery would maintain sufficient storage tanks and support facilities to handle the production, handling, blending, and distribution of the products produced by the refinery. An inventory of the storage tanks is shown on Table 3-3.

Rail loading would be provided for light diesel, heavy diesel, regular gasoline, and premium gasoline. These loading facilities would use vapor recovery systems to control emissions during loading.

Truck loading facilities, with vapor recovery systems, would be available for loading and shipment of light diesel, heavy diesel, regular gasoline, premium gasoline, and propane. Field butanes would be delivered to the refinery butane storage vessels via transport trucks.

Chapter 4 — Solid Waste Generation (Hazardous and Non-Hazardous)

Non-hazardous and hazardous waste would be generated from many of the MHA Refinery processes, petroleum handling operations, as well as the wastewater treatment and water recycling plant operations. The majority of solid wastes to be generated would either be non-hazardous residuals or excluded from being regulated as a waste. Wastes would be recycled or regenerated within the refinery as much as practical, with the remainder recycled or disposed of offsite at approved third-party facilities. Most of the wastes to be generated would be in the form of oily, non-oily and biological sludges (especially the waste water and water recycle facilities), spent process catalysts, product filter/adsorbent media, slop oil emulsions/solids, tank bottom sludge, spent liquids such as caustic and acid solutions, and pond sediments. The generation of hazardous wastes would be minimized due to the nature of the "clean" feedstock, size and design of the refinery, compliance with RCRA, and pollution prevention measures. A general summary of the major types of wastes to be generated is presented in Table 4-1.

The solid wastes generated from the MHA Refinery would be significantly less than generated by a conventional refinery. The proposed refinery would use a feedstock (sweet synthetic crude oil) that has fewer contaminants than conventional crudes and uses design features that help to minimize waste generation. Some of the main design features that would contribute to the reduced solid waste generation are discussed in Chapter 6.

It was not possible to develop estimated volumes and RCRA characteristic hazardous designation of many of the individual solid wastes that the refinery is expected to generate. Since detailed engineering has not been completed for the refinery, it is impossible to precisely identify all specific waste generation points and associated waste handling measures throughout the refinery. Therefore, complete and detailed information on waste generation from individual units cannot yet be provided. While, general estimates of the types, and in some cases the amounts, have been provided based on waste generation at existing "traditional" petroleum refineries, there is little information available for waste generation from modern clean fuels refineries such as the proposed facility. This creates additional uncertainties when trying to make unit-by-unit comparisons.

The major types of hazardous wastes that may be generated at the refinery and the associated EPA hazardous waste codes are shown in Appendix 1**.** Estimates of the major waste streams and their associated volumes that the MHA Nation's refinery would generate were prepared using comparisons to historical waste generation data for the U.S. petroleum refining industry. The historical data were obtained from a publication of the American Petroleum Institute (American Petroleum Institute 1991a). Once the final design has been completed, a more accurate estimate can be made of the types and amounts of wastes that would be generated.

Table 4-1 Major Types of Waste Generation

Site of Generation	Types of Wastes
Operations and Maintenance	Waste water [DO18] Spent Catalyst (K171, K172, D018, D004, D006, D001) Spent Caustic Solution (D002) Spent Amine [D001] Spent Acid [D001] Spent Filter/Absorbent Media [D001, D002, D003] Off-Spec Product [D001, D002, D003] Waste Oil/Oily Sludges [D001, U019] Wash Out Solids (flushing of equipment) [D001, D002, D003, Process Equipment Cleanup Sludge [Other than Heat Exchangers] Heat Exchanger Bundle Sludge [KO50] Storage Tank Sludge [Crude (K169), Product [D001, D018], Other] Other Oily Sludges [D001] Oil Contaminated Debris [D001 Spent/Used Cleaning Solutions [F001 – F005] Clarified slurry oil tank sediment [K170]
Water Recycle Plant	Water Plant Filter Cake (e.g., treatment of boiler blowdown) Waste water Unused and Used Chemicals [D001, D002, F001]
Waste water Treatment Wastes	American Petroleum Institute (API) Separator Sludge [KO51] DAF Float [KO48] Slop Oil Emulsions [KO49] Primary Treatment Sludges (Other than API Separator or DAF) [FO37] Secondary Treatment Sludges [FO38] Waste chemicals (e.g., flocculants) [D001, D002, F001] Wastewater [DO18] Wastewater Sludges [DO18]
Miscellaneous	Oily Rags/Debris [D001, D002] Empty Containers with/without Residual Laboratory Wastes (D001, D002, D003, U002, U159, U154, U239, U211] Maintenance Oily/Non-Oily Wastes [D001, D002, D009, F001] Plant Waste (Non-oily Trash) Surplus and Unused Chemicals [P022, U044, U154, U056] Spent Solvents [F001 – F005] Contaminated Soils [D001, D002, D003, D009] Scrap Metal/Equipment [D002, D003 Floor Dry/Absorbent [\D001, D002] Sand Blast Grit [C] Used Hydraulic Fluids [D001] Mercury (i.e., instruments) [D009] Paint and Paint Wastes [D001] Spent Filter Cartridges [D001, D002]

Source: American Petroleum Institute 1991a

Historically, petroleum refineries have yielded solid wastes (1991a). These estimates are for older conventional refineries that do not have the design advantages of the MHA Refinery. Estimated average waste quantities for 100 U. S. petroleum refineries are presented on Table 4-2.

Table 4-2 U.S. Petroleum Refining Industry Estimates of Waste Generation

Streams	Estimated Disposal Quantities by Year (Thousands of Wet Tons)		
Waste	1981	1987	1988
API Separator Sludge [K051]	393	365	191
DAF Float [[K048]	308	254	310
Slop Oil [K049]	144	66	86
Leaded Tank Bottoms [K052]	4	6	4
Heat Exchanger Bundle Cleaning [K050]	1	1	3
Total	850	693	594
Crude Throughput (metric tons)	574,900	631,212	650,128
Disposed Hazardous Waste : Throughput	1:676	1:910	1:1096
Disposed Hazardous Waste : Throughput weight %	0.15	0.11	0.09

Source: American Petroleum Institute 1991a

In 1988, the total amount of reported waste solids generated from all petroleum refineries located in the United States for disposal was 594,000 tons based on a crude throughput of 650,128,000 tons. Application of these statistics to the proposed refinery suggested the following solid waste generation estimates: 10,000 BPSD x 300 lb/bbl x .0009 wt. Fraction = 2,700 lb/day 1 percent is contributed from maintenance sludge = 27 lb/day. The maintenance sludge estimates were based on waste generated, on average, from tank bottoms and vessel and exchanger cleaning activities.

However, given the design of the refinery and the use of sweet synthetic crude oil as feedstock, the yield for the refinery would be estimated to be 576 lb/day. By combining this quantity of generated waste with the 27 lb/day of maintenance waste, this would result in a total waste generation of 603 lb/day. The waste water treatment unit (WWTU) contributes 96 lb/day of treated hazardous waste and the water recycle plant (WRP) contributes 480 lbs/day of treated non-hazardous waste of the total quantity of 576 lbs/day of waste generation. The basis for these estimates is depicted on Table 4-3. These waste sources are discussed in more detail later in this chapter.

A general profile of hazardous waste generation by petroleum refineries located in the Rocky Mountain region is shown on Table 4-5. It should be noted that these refineries are a minimum of thirty (30) years old and may not always employ state of the art technologies. Most of these refineries produce less than 50,000 barrels per day (BPD). These reported levels were presented for general information, with the reported information varying significantly based on the refinery's size, configuration (types of process units, etc.), crude feedstocks, timeframes evaluated, and resources available to the owners (Wyoming Department of Environmental Quality 2004). A general comparison of these refineries with the proposed MHA Refinery suggests the proposed amount of hazardous waste generation for the MHA Refinery (11 tons/year) is similar to the average hazardous waste generation for the other refineries (12 tons/year). The amount of hazardous waste generated at existing refineries varies from 3 to 21 tons/1000 BPD capacity (Table 4-4), and this variation appears to reflect the size, design and fuel use differences noted above rather than merely the throughput of the refineries. With the MHA Refinery being a new state-of-the-art refinery with pollution prevention measures and new technologies built into the design, hazardous waste generation would be expected to be lower than at the older refineries.

Table 4-3 Solid Waste Estimate Generation for the Refinery

Waste Source Stream	GPM	Volume of Waste[1, 2] (ppmw) O&G	TSS	BOD	COD	NH_3	S	Phenol	(lb/day) O&G	TSS
Hazardous Waste										
Oily Water	21	250	150	300	1,150	144	40	50	60	36
Sampling	0									
Instruments	0									
Vessel Drains	0									
Total									60	36
Non-hazardous Waste										
Water Recycle Plant	8.33		5,000						0	480
Cooling Tower	0									
Total									0	480
Total Disposable Solid Waste[3]									60[4]	516[4]

Notes:
1. ppmv = parts per million by volume, GPM = gallons per minute, O&G = Oil & grease, TSS = Total suspended solids , BOD = Biochemical oxygen demand, COD = Chemical oxygen demand, NH_3 = Anhydrous ammonia, S = Sulfur.
2. Design Criteria = segregated drains, no desalter, reboiled strippers (ex gas oil), no vacuum tower, totally enclosed samplers, maintenance drain out.
3. Potentially hazardous solids = 96 lb/day, Non-hazardous solids = 480 lb/day.
4. Includes process and stormwater, but excludes maintenance cleaning solid waste.

Table 4-4 General Profile of Petroleum Refineries in the Rocky Mountain Region

Refinery and Location	Capacity (BPD)	Average, Annual Hazardous Waste Generation (1989 – 1999) (tons per 1,000 BPD capacity)
Sinclair Oil Corp.(Casper, Wyoming)	22,000	15
Sinclair Oil Corp. (Sinclair, Wyoming)	65,000	3
Montana Refining Co. (Great Falls, Montana)	7,000	12
Tesero (Mandan, North Dakota)	60,000	13
Valero (Commerce City, Colorado)	28,000	8
ConocoPhillips (Commerce City, Colorado)	58,000	9
Wyoming Refining Co. (New Castle, Wyoming)	12,500	21
MHA Refinery (Makoti, North Dakota)[1]	10,000	11

Note:
1. The MHA Nation Refinery is included for general comparison purposes.
Source: Wyoming Department of Environmental Quality 2004

Refinery Process Waste

The volume of wastes generated by the refinery would vary according to the ongoing site activities, with the two major activities being normal operations and periods of major maintenance activities (turn-arounds). During normal operations, there would be limited maintenance activities and waste generation would typically be limited to specific operational activities. Waste generation during maintenance periods, such as turn-arounds, would tend to be greater for a number of wastes than during normal operations. The operating philosophy of the refinery would be to avoid planned total plant outages, with such outages occurring about once every 5 years. This would be accomplished by individual units or groups of interdependent units being shut down in rotation so that a partial shutdown would be planned each year. This would minimize the effect of lost production and the volume of wastes mentioned above. The types of wastes generated during routine maintenance and turn-arounds are discussed below.

The major source of non-hazardous and hazardous waste generation during normal operations would be associated with the waste water treatment in Unit 36. The major source of non-hazardous waste generated during normal operations would be sludge generated during the treatment of non-contaminated waste water (non-oily water from boiler blowdown) in the WRP. The major source of hazardous waste to be generated would be associated with sludge generated during the treatment of contaminated or oily waste streams in the WWTU. Sanitary waste water from the offices and other buildings would be disposed of via a separate, sanitary septic system and leach field.

Other types of solid wastes that could be expected to be generated during normal operations include the following:

- Oily Rags/Debris
- Non-oily Trash
- Empty Containers with/without residual
- Spent Solvents
- Surplus and Used Chemicals
- Spent Filter Cartridges
- Spent Caustic Solutions
- Spent Acid(s)
- Spent Amine
- Off-Spec Product
- Wash Water
- Laboratory Wastes
- Maintenance Shop Wastes
- Sludges Associated with Storage Tank Draws
- Contaminated Soils

Equipment Cleaning and Turn-Around Waste

The various types of wastes that may be generated during major maintenance periods, such as turn-arounds, are shown on Table 4-1. The purpose of this section is to focus on some of the major waste streams generated during maintenance activities.

Typical major maintenance activities would consist of cleanout of the major processing equipment, storage tanks, and process sewers/sumps of undesirable residues that have accumulated over time; replacement of catalysts, absorbents and other types of process media that become depleted over time; required repairs; and any other actions necessary for the improved operation of the refinery. Quantities of solid wastes that could be generated in the form of: sludges; spent materials such as catalysts, absorbents, and chemical and cleaning solutions; oil-contaminated debris; paint and paint wastes; empty containers with residue; scrap metal; sand blast grit; and industrial trash (for example, packing, wood, rags, paper materials). Therefore, the quantity of waste generation can be significantly higher for a short period during turn-arounds, as compared to the same time during normal operations.

Process Equipment Sludge

Periodic cleanout of the residues within various pieces of process equipment would be necessary to maintain the preferred processing efficiencies. Such wastes would typically be generated during maintenance periods, especially during plant turn-arounds. Solid residues that are not listed as hazardous waste that cannot be recycled or reused would be tested to determine whether they are a RCRA characteristic hazardous waste.

One of the major cleanout activities associated with equipment maintenance is associated with the heat exchangers. Heat exchangers would be routinely cleaned to maintain their efficiency. Accumulated residues deposited from the process streams that are either heated or cooled would be removed. This would be accomplished using hydro-blasting and steam to clean the tube bundles. Cleaning would occur on a designated concrete cleaning pad, which would contain a drain sump that would overflow to the oily process sewer for treatment in the refinery WWTU. The concrete pad would be designed to collect as much of the solid residues as possible; these residues would be placed in approved hazardous waste drums for temporary storage and eventual transport to an approved third-party off-site hazardous waste disposal site.

The scale and hydrocarbon solids waste generated from this cleaning activity is classified as hazardous waste KO50 – heat exchanger bundle cleaning sludge. The cleaning of the heat exchanger is expected to occur during the turn-around of the refinery, which would occur approximately every three to five years. However, excessive fouling, such as in the crude unit, could require more frequent cleaning for some of the heat exchangers. The refinery does have the advantage of using synthetic crude oil as the primary feedstock, which should reduce the amount of fouling, as compared to the refineries using typical crude as a feedstock.

Primary Sewer Sludge

The source of primary sewer sludge and oil emulsions would be the waste water collection system and WWTU. Oily sludges would settle out of the waste water streams in sumps or associated process sewer lines within the refinery. The sludges in the sumps would be cleaned out periodically and classified as a listed hazardous waste (F037 petroleum refinery primary oil/water/solids separation sludge). These sludges would be cleaned as necessary, but typically not more than every three to five year refinery turnaround period. The solids would be recovered and sent to a third party licensed hazardous waste disposal site.

The term “process sewer” is used for piping and collection systems used to convey oily waste water (oil, emulsified oil, or other hydrocarbons) generated during the refinery process and discharged to the waste water treatment system. A stormwater sewer system refers to a collection system and piping used to collect and convey stormwater runoff, which is segregated from the process waste water streams. Stormwater sewer systems can consist of systems conveying “oily” stormwater runoff, which are discharged to a waste water treatment system or separate systems conveying uncontaminated stormwater runoff that can be recycled or discharged via a permitted discharge point. In the case of the MHA Nation’s proposed refinery, the sanitary sewer collection system and piping would be a separate system that would use an on-site sanitary septic system for treatment and disposal. This system would collect waste water from sources such as toilets, lavatories, and sinks.

Slop Oil Emulsion Solids

Recovered oil would be sent to a heavy slop tank, including skim oil from the API separator, oil from oily sludge dewatering, and bottom tank draws from the raw heavy oil tank and reduced crude storage tank. The recovered oil would be recycled to the crude unit for reprocessing. Any slop oil emulsion solids that could not be recycled would be disposed of at a third-party off-site hazardous waste disposal site. The slop oil emulsion solids would be classified as a listed hazardous waste –K049. The recovered oil would be excluded from RCRA regulations because it is recycled to the process.

Storage Tank Bottom Wastes

Given the clean sweet synthetic crude oil feedstock that the refinery would use, the accumulation of solid residues (K169) in storage tanks would be expected to be well below those for conventional crudes. The upgraded synthetic crude would have virtually no impurities and bottoms content as compared to conventional crude that would contain a full spectrum of molecules (International Energy Agency 2000). The reason for this is that the synthetic crude oil, which would be produced by upgrading of bitumen (recovered from tar sands), would have already been treated before arrival at the refinery via a pipeline. Such treatment (for example, coking or hydrocracking, distillation, and desulfurization) would result in a high quality, light sweet crude oil with low levels of particulates and sulfur. The sweet synthetic crude oil would contain little or no residue whereas a typical conventional crude oil may contain about 8 percent residue (Syncrude Canada, Ltd. 2004).

Although comparative statistics are not available, a “rough” comparison of tank bottom waste generation between conventional crude and synthetic crude oil can be made based on composition of the crude. Table 4-5 lists a typical synthetic crude oil (sweet synthetic) and several conventional crude oils. The vacuum residuum levels refer to the heavier hydrocarbons, such as gas oil, remaining in the crude following upgrading of the synthetic crude oil before shipment to the refinery via pipeline. These heavier hydrocarbons are the main fraction of the synthetic crude oil susceptible to settling out while the crude oils are being stored. As can be seen on Table 4-5, the vacuum residuum concentration in the synthetic crude oil (< 1.0 vol%) is 5 to 10 times higher than for the other crude oils (5.7 to 10.8 vol%). This indicates that the synthetic crude oil, which has fewer of the heavier hydrocarbons, has less heavier hydrocarbons settling out in storage tanks.

Table 4-5 Comparison of Vacuum Residuum in Conventional Oil and Synthetic Oil

Crude Oil	Gravity (°API)	Sulfur (wt%)	Vacuum Residuum (Vol%)
Syncrude (sweet synthetic)	32.5	0.20	< 1.0
Light Louisiana Sweet	36.1	0.45	5.7
West Texas Intermediate	40.8	0.34	10.8
Brent	38.6	0.29	9.2
Bonny Light	33.9	0.14	4.8

Source: Woolley 2005.

Tank bottom wastes that accumulate in storage tanks typically consist of solids found in the stored material (for example, crude and various intermediate process streams); rust or scale from tanks, pipes and other equipment; and heavy hydrocarbons. Periodic tank cleaning would occur to remove solids that settle in the tank over time. The purpose of the cleaning could be to recover lost tank capacity, to inspect tank integrity, a change in service, and to repair the tank. The frequency of tank cleanouts would largely depend on the type of material stored. The storage tanks that typically require more frequent cleanout would be the crude oil and heavy and middle distillates. Cleaning of the tanks may be required every 6 to 9 years, depending on the service of the tanks. However, a storage tank could be cleaned out more frequently if the tank required repair or refurbishment.

The synthetic crude oil tank sludge would be designated as a "listed" RCRA hazardous waste (K169 – crude oil storage tank sediment). Therefore, any tank bottoms removed from the synthetic crude oil storage tanks would be handled as a hazardous waste. The amount of tank bottoms generated would be minimized by the use of pretreated synthetic crude oil and fixed tank mixers that help keep solids from settling.

Whether the tank bottom sludge from the remaining non-crude storage tanks would be classified as hazardous wastes would be determined by RCRA characteristic testing. Typically lighter product tank bottoms, such as gasoline, would be classified as a hazardous waste because of the levels of benzene. For the refinery, light products such as gasoline may contain benzene levels high enough to cause the bottom sludge to be designated as a hazardous waste. However, the middle distillates may not contain benzene and specific metals at levels that would cause the bottom wastes to be considered as a hazardous waste.

The cleaning of tanks would entail centrifuging or dewatering of the sludge to minimize the amount of solid residue. Recovered oil would be returned to the refinery for processing and waste water that would be generated would be sent to the oily water sewer for treatment in the WWTU. Solids would be shipped to a properly permitted third-party off-site disposal site.

The production of heavy oil would be expected to be less than 1 percent from the hydrocracking process. The feedstock would have an end boiling point of less than 1000ºF and the heaviest component would be fed to the hydrocracker. This small bottoms stream would be sent to a user permitted to burn or blend the material.

Spent Catalysts

A number of catalysts would be used throughout the refinery for a variety of purposes, including promotion of hydrocarbon conversion reactions (hydrocracking and isomerization), reduction of the sulfur and nitrogen content of certain hydrocarbon streams (hydrotreating), conversion of sulfur, and conversion of natural gas to hydrogen for use in the hydrotreating and hydrocracking reactions (Table 3-6). Catalysts that would be used in these processes would lose effectiveness over time and would be required to be regenerated or replaced. Although the frequency of replacement with new or regenerated catalyst would depend on the type of catalyst, most would be replaced every 3 to 5 years. Consequently, replacement typically would coincide with major maintenance periods, such as turn-arounds.

Major spent catalysts that would be generated at the refinery include metal-impregnated refining catalyst generated from processes that treat, crack, and reform hydrocarbon streams. The metals within the catalyst that would create the necessary reactions could result in the spent catalysts being considered hazardous. Two types of spent catalysts would be "listed" hazardous waste (K171 – spent hydrotreating catalyst and K172 – spent hydrorefining catalyst). Spent catalysts that would be recycled would be excluded from regulation.

Once the catalyst has been removed from the process vessel, it would be handled in one of the following manners (California Environmental Protection Agency 2004):

- Regeneration of the catalyst — the refinery would make every effort to first regenerate or reuse catalyst whenever it is possible. The catalyst would be regenerated by the supplier or appropriate vendor until the regenerated catalyst would be inadequate for further regeneration and reuse.
- Reclamation of spent catalyst — reclamation would involve the recovery of the catalytic metals, which would typically be used to manufacture new catalysts. Catalysts that contain noble metals, such as platinum or rhenium, would be returned to the catalyst vendor (or a designated third party service provider) for recovery of the metals.
- Recycling of spent catalyst — metal processing facilities would recover catalyst for such reuse as a feed substitute in the smelting process.
- Disposal of catalyst as a waste — where reclamation of some catalysts, such as absorbents used for sulfur recovery, would not be economically viable, the catalyst would be disposed of in an approved third-party off-site waste disposal site. For catalysts not listed as a hazardous waste, testing would be performed to determine whether the catalyst would qualify as a RCRA-characteristic hazardous waste. These waste materials typically would consist of the original catalyst plus feedstock residues and corrosion products. Before discharging these catalysts from the reactor, they would be decoked inside the reactor to minimize the amount of residues.

Spent Caustic Solutions

Caustic solutions would be used throughout the refinery for a number of purposes, including removing entrained catalysts, converting sulfur compounds, and possibly neutralizing low pH waste water. Examples of process units where caustic solutions would be used include the distillation section of the crude unit and the isomerization unit. The spent caustic solutions would be sent to a common spent caustic solution neutralization tank. Once neutralized, the solution would be shipped to an approved third-party waste disposal site.

The spent caustic solution stream discharging to the refinery's neutralization unit would only be designated as a hazardous waste due to corrosivity. As a result, the neutralization unit, as constructed, would not be required to obtain a RCRA permit for treatment (40 CFR 270.1(c)(2)(v)).

Water Treatment Wastes

Raw Water

A WRP would be used to purify and recycle water to minimize water usage. The WRP would process water plant sludge, boiler blowdown, boiler feedwater treatment effluent, steam condensate drains, and other mildly contaminated waste water. These streams would be segregated into a separate drainage system for delivery to the WRP. This non-oily water/solids stream would bypass the API separator to avoid commingling with the hazardous API separator sludges and float streams, thereby reducing the amount of hazardous waste to be managed.

The WRP would consist of a solids clarifier with sludge thickening and drying to produce a waste cake that would be disposed of in a non-hazardous Class 2 landfill. The waste cake would be sampled periodically and analyzed for representative hazardous constituents to ensure and document that the waste is non-hazardous. Waste water generated during the sludge thickening would be routed to the WWTU. The estimated amount of this non-hazardous dried sludge cake would be 480 lb/day.

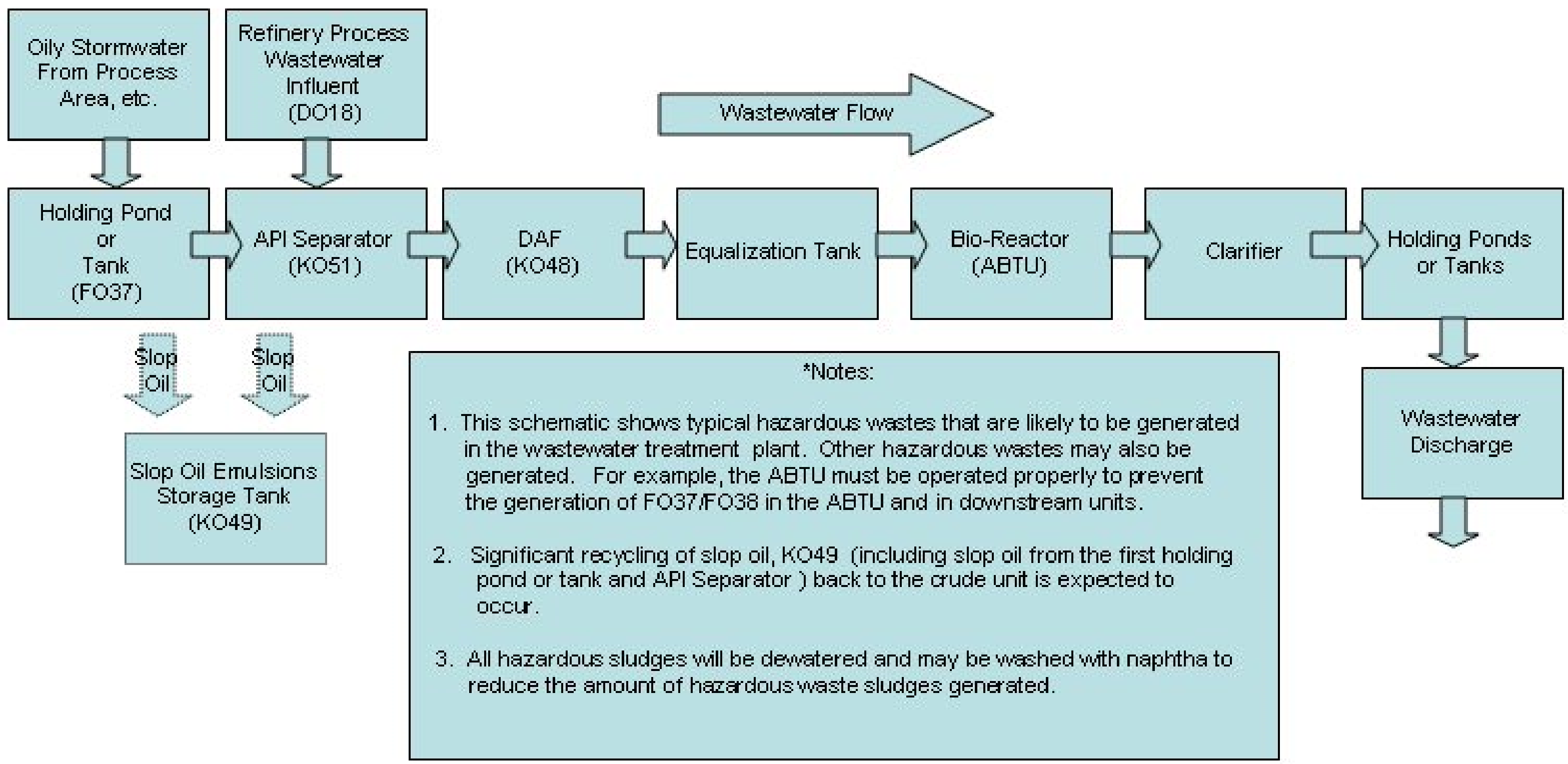
WasteWater

Under Alternative 1, The WWTU would consist of the following main components: Holding Pond [Oily Stormwater Only] – API Separator – Dissolved Air Flotation (DAF) – Equalization Tank – Biotreatment Reactors (also referred to as an Aggressive Biological Treatment Unit (ABTU) – Clarifier – Sludge Thickener – Sludge Dryer [Two Holding Ponds receive final effluent]. Figure 4-1 provides a general schematic of the refinery wastewater treatment system hazardous waste generation. .Under Alternative 4, the holding ponds would be replaced by tanks, and hazardous waste sludges would be centrifuged and washed with naphtha to reduce the amount of hazardous waste sludge generated.

Figure 4-1 General Schematic of Refinery Wastewater Treatment System Hazardous Waste Generation*

-Solid and Hazardous Waste Management Report, MHA Nation EIS - (EPA, May 2006)

[Based on Information Provided by Greystone Environmental Consultants, Inc.]



The primary solid wastes produced by the operation of the WWTU are summarized on Table 4-6. Sludges from the API Separator and bio-treatment clarifier are fed to the sludge thickener and sludge dryer, resulting in an estimated 96 lb/day of hazardous dried sludge. This sludge would likely be disposed of in an offsite, approved hazardous waste landfill which meets LDR treatment standards in 40 CFR Part 268. If not disposed of in an approved hazardous waste landfill, the sludge likely would be incinerated.

Table 4-6 Waste Generation for the Waste Water Treatment Plant

Waste Description	Waste Classification[1]	Frequency of Generation	Estimate of Quantity Generated	Source of Waste Generation
Primary Holding (1) Pond Bottom Sludge	F037/C	Periodic	Na[2]	Process Surface Stormwater Runoff
Secondary Holding Ponds (2) Bottom Sludge	C	Periodic	Na[2]	WWTU and Primary Holding Pond
Evaporation Pond Bottom Sludge	C	Periodic	Na[2]	Non-process Surface Stormwater Runoff
Firewater Ponds (2) Bottom Sludge	C	Periodic	Na[2]	Evaporation Pond
API Separator Sludge	KO51	Continuous	Comb[3]	Sludge Removal from API Separator
Dissolved Air Flotation (DAF) float	KO48	Continuous	Comb[3]	Oil removal from oily water sewer
Equalization Tank Solids	C	Continuous	Comb[3]	Equalization Tank
BioReactor Solids	C	Continuous	Comb[3]	Bioreactor
Clarifier Solids	C	Continuous	Comb[3]	Bio reactor
Slop Oil Emulsion Solids	KO49	Continuous	Na[2]	API Separator Process
Sludge from Process Sewer Sumps and tanks	FO37	Periodic	Na[2]	Sewer Sumps
Sludge from Process Stormwater Sumps	F037/C	Periodic	Na[2]	Contaminated runoff from Process Area; no dry weather flow
Sludge from Non-Process Stormwater Sumps	C	Periodic	Na[2]	No dry weather flow

Notes:
1. Waste with classification of C (Characteristic), including DO18, will be tested for RCRA Characteristics when sludge is removed for handling (i.e., thickening and as necessary, drying).
2. Na = waste volumes cannot be accurately calculated at the current time.
3. Comb = these waste streams are combined for sludge dewatering and drying, resulting in an estimated 96 lb/day of cake [~1.5 tons/month]. This waste would be hazardous due to the mixing of the waste with a listed hazardous waste – API Separator sludge and DAF Float.

Refinery Miscellaneous Wastes

The refinery would generate common types of wastes. The following sections address these wastes.

Laboratory Wastes

The refinery would include a small laboratory that would be used to support the refinery's operations, including quality control testing of feedstock, intermediates, blending agents, process chemicals, and products and compliance testing of water, waste water and solid waste. The chemicals and materials used in the laboratory would consist of those typically found in such a support laboratory.

Periodic generation of hazardous wastes may occur, including excess or unused chemicals, spent solvents, reaction products, test samples and spent contaminated materials such as:

- D002 – Waste Corrosive Materials and Solutions (acetic acid, chromic acid, hydrochloric acid, nitric acid, perchloric acid, phosphoric acid, ammonium hydroxide, potassium hydroxide, sodium hydroxide, oleum and sulfuric acid).
- D003 – Reactive Wastes (acetyl chloride, chromic acid, cyanides, hypochlorites, organic peroxides, perchlorates, permanganates, and sulfides).
- Solvents such as: acetone (U002, D001), benzene (U019, D018), chloroform (UO44, D022), ethanol (U001, D001), ethyl ether (U117, D001), hexane (D001), isopropanol (D001), methanol (U154, D001), methyl ethyl ketone (U159, D035), methylene chloride (U080), pentane (D001), petroleum ether (D001), toluene (U220), xylene (U239, D001), carbon tetrachloride (U211, D019) and ignitable liquids (D001).
- Spilled chemicals and other hazardous materials
- Debris contaminated with a hazardous material (paper towels, rags, disposable gloves, disposable lab-ware, etc.)

The amount of such wastes cannot be calculated at this time. However, the amounts expected to be generated would be relatively small and would be handled (treatment, storage and disposal) as per recognized and acceptable industry laboratory protocols. The handling procedures would adhere to all applicable RCRA hazardous waste regulatory requirements (including applicable exclusions). As allowed by regulations, laboratory wastes may be disposed of in the on-site WWTU, recycled, or transported to an approved off-site hazardous waste disposal site.

Maintenance Shop Wastes

The refinery would have a maintenance shop to maintain and repair equipment and other components, vehicles, and other equipment used in support of the refinery's operations. Wastes that may be generated are presented on Table 4-7. It is anticipated that the majority of the wastes would be either excluded from hazardous waste regulations or considered non-hazardous wastes. It is not currently possible to accurately estimate the quantity of hazardous wastes that would be generated, but based on the types of wastes and the size of the refinery, the amount of wastes would be expected to be minimal. The quantities generated on a monthly basis would depend upon refinery activities (such as routine operations, major maintenance and repair activities, and turn-arounds). The wastes would be disposed of in a municipal or industrial landfill or a third-party hazardous waste site, as appropriate.

Paint Wastes

Periodic painting of refinery equipment, storage facilities, and buildings would occur as part of the refinery's maintenance program. A minimal amount of paint wastes (unused paint and solvents) would be generated, with the potential to be the highest during three to five year turn-arounds. These wastes would be temporarily stored in containers and at locations that meet applicable RCRA requirements. Wastes would be stored for less than 90 days and, depending on the hazard characteristic of the wastes, sent off-site for either recycling or disposal in an approved disposal facility.

Table 4-7 Maintenance Shop Wastes

Waste	Waste Classification[1]	Method of Disposal[2]
Batteries	Universal	Recycle
Used Oil	C /Used oil regulations apply	Recycle
Used Oil Filter	C/ [Exclusion 261.4 (b) (13)]	Hot drained (>600°F), Crush and Recycle or Drain and Dispose of in Municipal Landfill
Used Shop Towels, Rags	C	If contaminated with oil or listed hazardous waste, dispose of as a hazardous waste; if not contaminated, dispose of as a non-hazardous waste
Solvents (Parts Washing)	C[3]	Recycle (e.g., Safety Kleen)
Antifreeze	C	Recycle
Aerosol Spray Cans	C[3]	Completely Empty and Recycle or Dispose of
Shop Wash Water	C	Discharge to onsite waste water treatment system as appropriate
Refrigerants	C	Recover and/or Recycle
Scrap Metal	C [Exclusion 261.4 (a) (13)]	Recycle or Dispose of (Non-contaminated metal residue)
Brake/Transmission Fluids	C	Recycle
Floor Dry/Absorbent	C	Dispose as hazardous or non-hazardous waste
Used Fluorescent Bulbs	C	Recycle or assume 1-2 lamps infrequently; send to Municipal LF
Used Hoses, Gaskets	C	Municipal Landfill (No free liquids)
Mercury Switches	Universal Waste	Recycle
Paint Wastes (e.g., paint, waste solvent)	C[3]	Recycle if possible; dispose as hazardous or non-hazardous waste, as appropriate
Packaging Material, Paper Trash	C	Dispose of in Municipal Landfill (no free liquids, oily or hazardous material residues)

Notes:
1. Wastes noted as "C" (characteristic) destined for disposal rather than recycle will be considered as a non-hazardous waste unless a determination is made indicating the waste is a RCRA hazardous waste. This determination will be made by either "applying knowledge" of the waste characteristics or by applicable testing of the appropriate RCRA characteristics, e.g., ignitability, toxicity, reactivity, and/or corrosivity.
2. State regulations may vary as to the classification of some wastes, so regulations for the states where wastes will be disposed of will be assessed in order to ensure approved transportation and disposal.
3. These wastes may be composed of specific "listed" hazardous wastes, e.g., halogenated and non-halogenated solvents.

Container Wastes

The refinery would use some bulk materials that are shipped, stored, or used in drums, with 55-gallon drums being a common size used by distributors. The use of these drums containing materials such as liquid chemicals could result in the potential losses of container contents due to the required handling and resulting accidents. Although the refinery would be required to use drums for some applications, the refinery would replace drums with small bulk storage tanks in other applications where it would be feasible and cost effective. However, when the use of smaller drums was the most feasible choice, the refinery would have procedures in place for the proper handling, storage, and monitoring of drums in accordance with applicable RCRA requirements.

Any emptied drums typically would be transported to the distributor, a reclaimer, or a disposal facility only if the drums met the definition of "empty" as defined by EPA (40 CFR 261.7(b)(1)(2)(3)). To the degree possible, empty drums would be returned to the distributor of the product; otherwise, the drums would be sent to a reclaiming facility, or lastly, an approved disposal facility. If it was impossible to recycle a drum containing a non-removable hazardous residue not meeting the definition of "empty," then the drum would be shipped to a hazardous waste disposal site for disposal.

Chapter 5 — Waste Storage, Treatment, and Transportation for Off-Site Disposal

This chapter addresses, in general terms, selected issues pertaining to the storage, treatment, and transportation of wastes for off-site disposal. Additional information is also provided in the chapters that follow.

Storage of Wastes

Some wastes designated as "hazardous" would be temporarily stored on site prior to handling and shipment offsite to permitted commercial facilities for treatment, disposal, or both. Any waste generated in the units would be contained and controlled before placement in storage/shipment containers. In order to be exempt from RCRA TSD permit requirements (under certain scenarios), no hazardous wastes would be stored for more than 90 days from the time of generation, unless an extension is requested by the refinery and granted by EPA, as permitted by 40 CFR 262.34 (b). As required by the RCRA regulations, reasons for such an extension would be limited to unforeseen, temporary, and uncontrollable circumstances. The temporary storage of hazardous wastes would take place in compliance with requirements for management of tanks, containers, drip pads, or containment buildings (40 CFR 262.34 (a)). If hazardous waste is stored for more than 90 days without an extension being granted by EPA, the facility would become a RCRA storage facility and would be subject to a RCRA TSD permit.

Hazardous waste container storage areas would be curbed concrete structures designed to contain drips and spills. Also, all hazardous waste and wastewater tanks would have secondary containment, double-lined sidewalls and floors, and leak detection systems. The methods of waste storage used would depend on the chemical and physical characteristics and type and concentration of the waste. Wastes to be shipped off site would be placed into appropriate shipping containers, such as 55-gallon drums, or containers designed for special wastes, such as laboratory chemicals and medical wastes. These storage containers would be stored temporarily in approved storage facilities engineered to protect people and the environment from contamination. These facilities would be routinely inspected by designated refinery personnel to ensure the containers were intact and the facilities and containers were in compliance with all regulatory health and safety requirements, such as a contingency plan as required by 40 CFR 262.34.

Precautions would also be taken to protect and maintain the integrity of non-hazardous wastes being temporarily stored prior to shipment off site for treatment, disposal, or both. These wastes would be stored in a fashion to avoid contamination of the environment and exposure to people, such as containment of dried sludge originating from the WRP.

Treatment and Disposal of Wastes

Hazardous and non-hazardous wastes would be generated, recycled, stored, and treated during refinery operations. Wastes to be disposed of would be transported off-site to an approved waste management facility. The method of disposal would be dependent upon the nature of the waste residuals,; applicable regulations; feasibility of regenerating, recycling, or reclaiming the wastes; and availability of approved off-site treatment and disposal facilities. For example, the sour water-stripper and benzene/VOC stripper would remove oily and non-oily contaminants from refinery process streams, recycling recovered materials (benzene/VOC and sulfur compounds) back to the appropriate process units. This would reduce the loading on the WWTU and generation of additional wastes. The WWTU would generate and /or treat the bulk of hazardous waste at the refinery. In addition, under certain conditions sludges generated in the WWTU could be centrifuged and washed with naphtha to reduce the amount of hazardous waste sludges generated. No wastes would be disposed of in or upon the refinery property. Various disposal methods that would be used at the refinery are discussed in earlier sections of this document and are summarized for major waste streams on Table 5-1.

The goal of the refinery owner would be to make every reasonable effort to regenerate, reuse, and/or reclaim waste residuals, with land disposal at third-party off-site permitted facilities being the last choice. Some wastes would be treated onsite and temporarily stored prior to disposal. Under Alternative 4&A , the methods of managing the waste in tanks (instead of the holding ponds used in Alternative 1) could be designed in such a manner that on-site activities would not trigger RCRA permitting requirements. For example, on-site treatment of various hazardous waste streams would be carried out under the WWTU exemption available under the RCRA regulations (40 CFR 264.1(g)(6)).

Transportation of Wastes

Before shipment, waste would be stored as described in the “Storage of Wastes” section above. Most of the hazardous wastes generated at the refinery would be managed on site. Most of the hazardous waste generated at the refinery on a routine basis would be associated with the WWTU. In the WWTU, oil would be recovered for recycling to the crude unit. API separator sludges and other hazardous sludges would be dewatered, potentially washed with naphtha, dried, and then shipped to a hazardous waste disposal site. This treatment would greatly reduce the amount of hazardous waste generated and transported off site for disposal in a third-party hazardous waste disposal facility. Most of the spent catalysts would be regenerated or recycled by third-party reclamation facilities, thereby avoiding being classified as a waste and having to be handled as a waste.

Most of the hazardous and non-hazardous wastes to be shipped off site for recycling or disposal would be moved by truck, with the rest transported by rail. Shipments by rail typically would involve wastes being shipped in large volumes or being shipped to a specialized reclamation or waste disposal facility located a long distance from the refinery. Before shipping any hazardous wastes off site, the shipment would be packaged, labeled, marked, and placarded per state and federal requirements, including the U.S. Department of Transportation's Hazardous Material Regulations (49 CFR Parts 172, 173, 178 and 179). Experienced, professional transportation specialists with the appropriate licenses and permits would transport wastes from the refinery to the designated recycling, reclamation, or disposal facility in accordance with RCRA transporter requirements at 40 CFR Part 263.

Table 5-1 Waste Management Options

Waste	Minimization Options			Treatment and Disposal Methods[1]						
	Reduce	Reuse	Recycle	A	B	C	D	E	F	G
Waste water Treatment Dried Solid Wastes										
API Separator Sludge	X					X[2]				
Dissolved Air Flotation Float	X					X[2]				
Biological Sludge	X					X[2]				
Clarifier Sludge	X					X[2]				
Equalization Tank Sludge	X					X[2]				
Holding Pond Sludge (1) [Receives Process Area Surface Stormwater]	X	X		X		X[3]				
Holding Pond Sludge (2) [Receives Waste water Treatment Plant Effluent & Discharge from Holding Pond Receiving Process Area Surface Stormwater]	X	X		X						
Evaporation Pond Sludge [Receives Non-process Area Surface Stormwater]	X	X		X						
Firewater Pond Sludge	X	X		X						
Water Recycle Plant Dried Sludge	X			X						
Spent Catalysts	X	X	X	X		X[3]				
Spent Caustic	X	X	X			X[3]			X	
Slop Oil Emulsions	X		X			X				
Recovered Oil	X		X							
Waste Oil Sludge (e.g., Maintenance)	X		X			X[3]				
Spent Amine	X	X	X			X[3]				
Spent Acids	X	X	X						X	
Chemical Wastes	X	X	X				X		X	X
Spent Filters/Absorbent Media	X		X	X		X[3]				
Heat Exchanger Bundle Sludges	X		X[4]			X	X	X		
Crude Storage Tank Sludge	X		X[4]			X	X	X		
Non-Crude Storage Tank Sludge	X		X[4]	X		X	X	X		
Containers – Drums/Barrels	X	X	X[4]	X	X	X[5]				
Contaminated Debris & Soil	X		X[4]	X	X	X[5]				
Used Batteries			X							X
Paint & Paint Wastes	X	X	X				X			X
Mercury	X	X	X							X
Sand Blast Grit	X			X		X[3]				
Laboratory Wastes	X	X	X			X[3]	X			X

Scrap Metal	X	X	X	X	X	X[3]
Oily Rags	X	X	X	X	X	X[3]
General Plant Trash	X			X	X	

Notes:
1. A = Class 1 Industrial Landfill (Non-hazardous), B = Municipal Landfill – Offsite, C = Hazardous Landfill – Offsite, D = Incineration – Off-site, E = Cement Kiln – Offsite, F = Deep Well, and G = Specialized Disposal/Recycling Facility (e.g., Universal waste and Used Oil). These options all refer to off-site third-party sites. The disposal option will be influenced by whether the waste is hazardous or non-hazardous.
2. Sludges from these waste streams would be dewatered, dried, and disposed of as hazardous waste as per the RCRA "mixture" rule (nonhazardous wastes mixed with hazardous wastes are deemed hazardous.
3. Disposed of as a hazardous waste if testing determines the waste meets the definition of a RCRA hazardouse waste.
4. Recovered oil or other product material.
5. Residues determined to be hazardous.

Source: Oil Industry International Exploration and Production Forum 1993

Two of the refinery waste streams that would be generated on a continuous basis and transported from the site on a frequent basis would be the dewatered and dried sludges originating from the WRP and the WWTU. Based on an estimated rate of 480 lbs/day of WRP dried sludge, the approximate number of truck trailer loads to ship the waste off site to a Class 2 landfill is estimated as follows:

480 lbs/day x 7 days = 3,360 lbs/week = 1.68 tons/week

1 load = 30 tons = 30/1.68-17.85 weeks ~ 4 months

1 load about every 4 months (non-hazardous)

The WWTU hazardous sludges would be generated at a rate of 96 lbs/day of dried, hazardous sludge. Because hazardous waste could not be stored on site for 90 days or more for a non-RCRA permitted facility, shipments of the waste would occur as follows:

96 lbs/day x 7 days = 672 lbs/week = 0.34 tons/week

1 load = 4 tons = 4/0.34 = 11.76 weeks = 2.74 months (< 90 days)

Non-hazardsous trash would be picked up and hauled to a municipal landfill on a weekly basis. This trash would consist of waste products, such as paper, cardboard, linings, wrappers, wooden packaging materials, food wastes, styrofoam, glass, aluminum foil, iron scrap, rope, twine, uncontaminated rubber, equipment belts, wirings, uncontaminated rags, metal bindings, non-contaminated and floor sweepings. Wastes would be collected in commercial dumpsters and loaded into a third-party garbage truck with a cart tipper. Approximately 5 tons of plant trash would be transported from the site each week.

Other non-hazardous and hazardous wastes that would be generated would need to be transported to an offsite treatment or disposal site on a periodic and less frequent basis. The estimated waste shipments for major wastes are presented on Table 5-2.

Table 5-2 Estimated Waste Shipments

Waste	Shipment Size (tons)	Shipment Mode	Shipment Frequency
Waste water Treatment Plant Sludge	4	Truck/Trailer	2¾ months
Water Recycle Plant Sludge	30	Truck/Trailer	4 months
Spent Catalyst	50	Truck/Trailer & Rail Car	1 to 3 Yrs
Spent Caustic Solution	TBD[1]	Truck/Tanker	TBD
Spent Amine	TBD	Truck/Tanker	TBD
Plant Trash	5	Garbage Truck	Weekly

Note:
1. TBD = To be determined.

Chapter 6 — Waste Management

Waste Management Plan

The MHA Refinery would develop and implement a Waste Management Plan (WMP) that would outline how the refinery would reduce, manage, dispose, and recycle its solid and hazardous waste that would be generated during construction and operations. The components of the plan would be integrated into the refineries operating procedures to ensure proper operation of the many interrelated systems of operating units so that an effective waste management system would be in place. Pollution prevention and waste minimization policies and practices would be a viable part of the WMP. The refinery's Safety, Health, and Environmental Management System (SHEMS) would be used to integrate waste management measures, including pollution prevention and waste minimization, more thoroughly into other day-to-day refinery operational activities. The SHEMS would be used to assess potential operational risks and to maximize operational integrity, reliability, and efficiency, with the main components of the WMP being a part of this assessment. Waste management operating procedures would be developed and maintained in order to ensure efficient and protective operation of a viable waste management system.

The approach to be taken by the refinery in the development and implementation of the SHEMS is presented in **A**ppendix 2. The focus of the SHEMS would be on compliance with Safety, Health, and Environment (SH&E) laws and regulations and SH&E performance that moves beyond compliance with both regulated and non-regulated aspects of refinery operations.

Pollution Prevention and Waste Minimization Measures

Two key components of a WMP include pollution prevention and waste minimization. For purposes of this document, pollution prevention is defined as reducing waste at its source (not generating waste in the first place). Pollution prevention focuses on multi-media pollution and waste, including air emissions, releases to surface and groundwater, and inefficient energy and materials use, and waste which is disposed of (e.g., landfill)., treated, or recycled (National Pollution Prevention Center 1997). Waste minimization includes recycling and other means to reduce the amount of solid and hazardous waste which must be ultimately treated or disposed..

Pollution Prevention is defined by the EPA as follows:

"…the use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes at the source. It includes practices that reduce the use of hazardous or nonhazardous materials, energy, water or other re-

sources as well as those that protect natural resources through conservation or more efficient use" (U. S. Environmental Protection Agency 1992).

The Pollution Prevention Act of 1990 (PPA) declared that the creation of potential pollutants should be prevented or reduced during the production cycle whenever feasible. The purpose of the statute is to assist industry in realizing source reduction opportunities and provide technical assistance and information on source reduction technologies and practices deemed to be needed. The pollution prevention program focuses on source reduction of any hazardous substance, pollutant, or contaminant entering a waste stream or otherwise released to the environment prior to recycling, treatment, or disposal. EPA is delegated the responsibility of providing assistance to the states by establishing a source reduction program to collect and disseminate information and provide financial assistance. Although industry's participation in this program is largely voluntary, the PPA does specify that facilities required to report releases to EPA for the Toxic Release Inventory (TRI) provide documentation of their procedures for preventing the release of or for reusing these materials (U. S. Environmental Protection Agency 1992).

RCRA requires that LQGs (generate 2,200 lbs or more per month of hazardous waste) and owners and operators of hazardous waste treatment, storage, and disposal facilities (TSDFs) comply with similar waste minimization requirements. Large Quantity Generators who transport waste off site must certify on the manifest that they "have a program in place to reduce the volume and toxicity of waste generated to the extent that is economically practical" (U. S. Environmental Protection Agency 1988). The owners/operators of TSDFs are required to prepare an annual certification that a waste minimization program is in place, and maintain this certification in the facility operating record. Such a program is typically implemented in an WPM developed to meet the individual facility's needs. LQGs are also required to submit biennial reports describing waste minimization efforts. The MHA Refinery, which will be an LQG (see Chapter 6), will be required to comply with applicable requirements of this paragraph.

RCRA, PPA, and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) require hazardous waste generators to evaluate and document their procedures for controlling the environmental impact of their operations (U. S. Environmental Protection Agency 1992).

The proposed refinery's WMP should include practices to minimize all pollutants, including nonhazardous and hazardous wastes, waste water discharges, air emissions, and energy and water consumption. The plan should include voluntary and mandatory reduction measures and meet applicable regulatory requirements. The refinery's WMP should focus on the following preferred categories, presented in order of priority:

- source reduction;
- recycling (reuse, recycle);
- treatment (stabilization, neutralization, precipitation, evaporation, incineration and scrubbing); and
- disposal (disposal at a permitted facility).

The WMP should be developed using reference materials such as EPA's Pollution Prevention Guide (U. S. Environmental Protection Agency 1992), Waste Minimization Opportunity Assessment Manual (U. S. Environmental Protection Agency 1988), Guide for Industrial Waste Management (EPA 1999), An Organizational Guide to Pollution Prevention (U. S. Environmental Protection Agency 2001b), Waste Minimization in the Petroleum Industry, A Compendium of Practices (American Petroleum Institute 1991b), Profile of the Petroleum Refining Industry (EPA 1995), and other guidance documents prepared by state and federal governmental agencies and applicable industry associations. The facility should also follow appropriate EPA Environmental Management Systems (EMS) guidance and the Resource Conservation Challenge (RCC) guidance. All employees should be trained in pollution prevention awareness and job expectations. Designated refinery staff should be trained in refinery-specific waste management and handling procedures, as well as emergency response procedures in the event of a spill or release.

The MHA refinery's pollution prevention and waste minimization measures of the WMP should be consistent with the EPA's pollution prevention program guide presented in EPA's *Facility Pollution Prevention Guide* (.

With a well designed and implemented WMP that includes the pollution prevention and waste minimization measures, the refinery should experience business and economic benefits. Effective source reduction and recycling, reuse, treatment and disposal approaches to waste management would help to reduce the following:

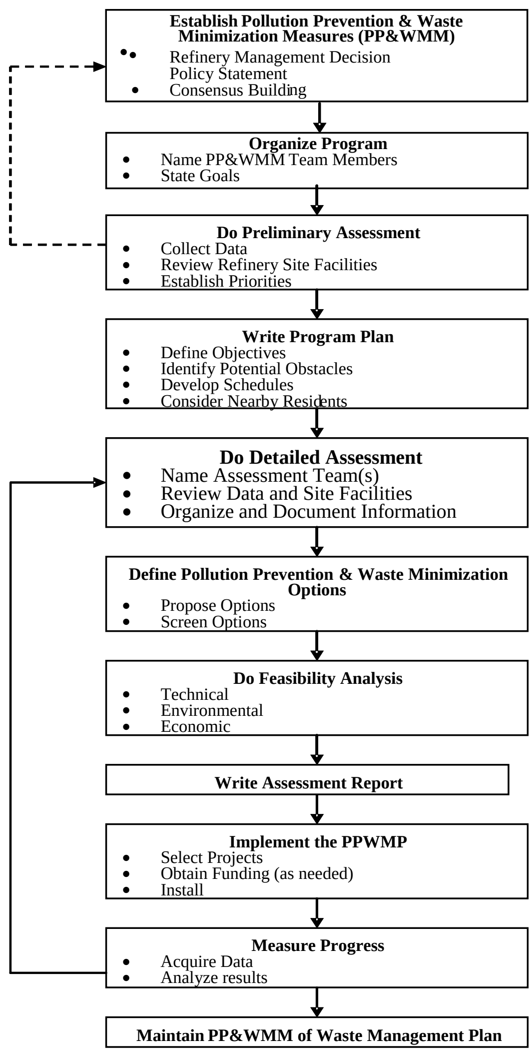
- quantity and toxicity of hazardous and solid waste generation;
- raw material and product losses;
- raw material purchase costs;
- waste management recordkeeping and paperwork burden;
- waste management costs;
- workplace accidents and worker exposure;
- compliance violations; and
- environmental liability.

(U. S. Environmental Protection Agency 2004a)

Two examples of waste minimization / pollution prevention activities that can be implemented at the refinery are:

-Use of air cooling instead of water cooling to eliminate sludge generation associated with conventional cooling towers (also reduces the amount of water needed at the refinery); and

-Use of a centrifuge and naphtha wash for WWTU sludges to reduce the amount of sludges generated (also increases the amount of oil recovered and recycled).



Source: U. S. Environmental Protection Agency 1992

Figure 6-1 Overview of Pollution Prevention and Waste Minimization Measures of the Waste Management Plan

Design and Operational Aspects

The design and operational aspects of the refinery equipment and support facilities should minimize the types and amounts of waste generated. Examples of some of the design and operating conditions that would help minimize the amount of non-hazardous and hazardous wastes generated are discussed below.

Synthetic crude oil Feedstock

The synthetic crude oil feedstock would have been upgraded before delivery to the refinery. Synthetic crude oil is manufactured from bitumen that has been desalted and then hydrocracked and fractionated, which results in the removal of most of the contaminants seen in conventional crude oil. Its very low sulfur content, very low metals content, and removal of the heavy boiling components found in conventional crude oil distinguish the synthetic crude oil, by significantly reducing the generation of refinery pollutants. The fact that a desalter would not be required is extremely advantageous, because the desalter in a typical refinery is a major source of contaminated waste water and a source of emulsified oil under carry with the desalter effluent water.

Process Upgrades/Modifications

Crude Distillation Pump-Around Circuit

The crude distillation tower would use four pump-around circuits to improve separation and increase energy efficiency. This would help to minimize the amount of solid waste generation by reducing the stripping requirement.

No Vacuum Distillation Unit

Because of the synthetic crude oil feedstock, a vacuum distillation unit would not be needed. This eliminates the attendant production of sour water condensate.

Reboil Strippers

The side strippers on the atmospheric crude column would be reboiled with hot oil to avoid commingling steam condensate with the oil in the column, which further reduces sour water production. The bottom stripper for atmospheric gas oil would require live steam stripping due to the temperature requirement, but this would be minimal.

Hydrocracking versus Fluid Catalytic Cracking Unit

The refinery would employ hydrocracking rather than fluid catalytic cracking. This would generate less waste than is inherent in fluid catalytic cracking. The use of hydrocracking would eliminate the production of aromatic cycle oils and fluid catalytic cracking slurry oil (decant oil) as well as the air emissions from the fluid catalytic cracking regenerator (CO, SO_2, NO_x, and particulates). Hydrocracking also assists in the hydrogenation and production of cleaner fuels that would reduce the emissions from the users' vehicles.

Air Cooling versus Water Cooling

The refinery would be designed to use air-cooling equipment to control the operating units with the minimum use of water. This would eliminate the need for a cooling tower and cooling water system, resulting in the lack of generation of cooling tower blowdown and potential hazardous waste sludges in the cooling tower and cooling water system. Cooling tower blowdown increases the total waste water flow, as well as adds solids to the waste water stream that can contribute to hazardous sludge formation. The use of air-cooling would also significantly reduce the amount of water required for refinery operations.

Waste Water Treatment System

Segregated drains would be provided to separate storm water from process waste water to minimize water contamination in the refinery process. All of the process and loading areas would be paved with concrete surrounded by curbs. All of the process drains would be sealed and elevated above the grade. Storm water drains inside the battery limits would be mounted flush with grade. The hydrocarbon drains would be segregated and direct hydrocarbon to a slop storage vessel, where the hydrocarbons can be returned to the process. The storm water collected within the battery limits (inside the process equipment areas) would be considered to be contaminated and carried directly by an oily water drain system to the WWTU.

Potentially contaminated storm water would be collected in a separate drain system and delivered to a holding pond for testing. If clean, under Alternative 1, the water would be discharged to one of the two Holding Ponds following the WWTU for release through NPDES Outfall No. 2 or released to the WWTU for treatment if contaminated. Under Alternative 4, tanks would be used instead of holding ponds, and an additional outfall (Oufall No. 2a) would be added for large storm events.

Uncontaminated non-process storm water would be segregated in a surface drainage system and delivered to the evaporation pond for release through NPDES Outfall No. 1.

Water plant sludge, boiler blowdown, boiler feedwater treatment effluent, steam condensate drains, and other mildly contaminated waste waters would be segregated for delivery to the WRP. This non-oily process waste stream would bypass the API separator, minimizing the production of hazardous API separator sludges. The WRP would consist of a solids clarifier with sludge thickening and drying in order to minimize the amount of non-hazardous solid waste to be disposed.

Oily water containing benzene would be segregated from the oily water drainage system. This material would be delivered to a steam stripper to recover benzene and volatile organic compounds, which would be returned to the process. The stripped water would be recycled or released for discharge.

Sulfur-bearing waste water stream would be diverted to a sour water stripper, where the sour gas is sent to sulfur recovery and the stripped waste water sent to the WWTU.

All instrument drains (level bridles, control valves, etc) would be collected in a separate drain head and delivered to a maintenance drain out. The vapors would be flared, the liquid hydrocarbon would be delivered back to the process, and the water would be directed to the sour water stripper.

All process and contaminated rainfall runoff waste waters would be treated on-site in the waste water treatment system and discharged from the facility via an NPDES-permitted outfall, a UIC well, or irrigation. Sampling would be conducted before discharge to verify compliance of the discharged waters with permit conditions. Non-contaminated stormwater runoff would be diverted to an evaporation pond where it would be either discharged to the firewater pond for emergency use or discharged via an NPDES-permitted outfall. The water would be sampled and analyzed before discharge via the outfall to ensure compliance with NPDES permit discharge limits. No discharges of waste water from the facility would occur except through NPDES-permitted outfalls, irrigation (which could potentially be covered under a RCRA TSDF permit for the wastewater treatment system), or UIC permitted underground injection.

Piping

Refinery piping conveying liquids that would contain feedstocks, products, or contaminants that could possibly affect ground water if released will be placed above ground whenever possible. This will allow for easy leak detection and repair and will help to prevent the occurrence of undetected and widespread subsurface contamination. Piping placed below ground would be double-walled with a leak detection system that could be easily monitored.

Sanitary Waste

Sanitary waste water from the offices and other buildings would be collected and disposed of via a sanitary sewer system. All water collected by this system would be discharged via a septic system and leach field. This would result in a reduced loading on the refinery waste water treatment system and less waste solids generation.

Storage Tanks

The crude oil storage tanks would be equipped with permanent tank mixers that would entrain a portion of the solids and heavy hydrocarbons. This would minimize the separation of these materials from the oil in the tanks, thereby reducing the generation of tank bottom sludges. The solid and heavy hydrocarbons entrained in the crude feedstock would be processed in the refinery process equipment.

The crude oil product storage tanks and tank farm would be constructed to minimize the potential for accidental releases of the products stored in the tanks. The lower one foot of each tank and the floor of each tank would be double-walled. The annular space of the double-wall system would be monitored periodically using a portable hydrocarbon gas monitor to verity there has been no inner wall failure. Additionally, each tank would be diked and the space inside the dike lined with a geotextile liner. Monitoring of the area below the geotextile liner would not occur because monitoring of the tanks would detect any releases. Thus, releases would be detected within the annular space of the tanks before release to the environment.

Rail and Truck Loading

The two loading areas would be paved with an impervious base using concrete surrounded by curbs. In addition, dual drain systems (process and stormwater) would be used. The concrete curbing would be designed to prevent releases of spilled hydrocarbons, chemicals, or both into the environment and allow drainage of any released liquids to be collected and returned to the waste water treatment system for treatment. All process drains, which would drain hydrocarbons back to the process for reprocessing, would be sealed and elevated above grade to prevent stormwater from entering the drains. Hydrocarbons collected in these drains would be returned for reprocessing. Stormwater drains would be mounted in the concrete flush with grade. Water collected in these drains would be delivered to the WWTU for treatment.

Solids Control from Various Sources

Heat Exchanger Operation and Cleaning

The heat exchanger equipment would be designed for minimum fouling (buildup of residue on the internal components) and efficient operation. In addition, the unit operations using exchangers would be optimized to further minimize fouling of the internal components of the exchangers. The feedstock would be clean, as compared to conventional crude, so that the importation of contaminants into the heat exchangers in the crude unit would be minimal.

Heat exchangers are required to be cleaned periodically to remove solids that build up on the internal bundles (coiled piping). The refinery would use a designated concrete pad with containment to retain solids from the tube bundle cleaning operations that could otherwise reach the oily water process sewer system. Any retained solids would be placed in RCRA-approved containers, such as sealed 55-gallon drums, labeled, temporarily stored in a RCRA-approved storage area, and eventually shipped off site for disposal in an approved hazardous waste disposal site. The waste water, as well as any accumulated rainfall, would be discharged to the waste water treatment system.

Storage Containers

Non-hazardous and hazardous waste placed in containers and temporarily stored on site prior to transport from the refinery would be stored in a manner to comply with applicable regulations and to minimize the potential for any release. Hazardous waste would be stored on concrete pads with curbing that are constructed as required by regulation to prevent releases to the environment. Rainfall runoff collected on the pad would be discharged to the waste water treatment system.

Where feasible and cost-effective, small bulk storage tanks would be used lieu of smaller drums for materials such as liquid chemicals used in the refinery operations. This would reduce the amount of handling and accidents, thereby reducing the amount of solid waste generation.

Process Stream Sampling

To collect a representative sample of a process stream, it is necessary to purge the sampling line. In the past, such sampling at refineries involved discharging purged product material to the oil water sewer before collecting the sample, At the MHA Nation's refinery, closed loop sampling systems would be installed so that samples of various process streams would be returned to the process line being sampled and not discharged to the oily water process sewer. Without these closed loop sampling systems, a large number of such sampling points could result in an appreciable quantity of hydrocarbons being discharged to the oily water process sewer.

Chapter 7 — RCRA Generator Status Determination

RCRA requires that generators of hazardous waste be regulated based on the amount of waste generated in a calendar month. There are three categories of these hazardous waste generators (Table 7-1). The identification and volumes of hazardous wastes anticipated to be generated during refinery operations were determined as best as possible in order to determine the generator classification. As previously discussed, determining volumes of many "individual" waste streams was not possible for the proposed facility (see Chapter 4). However, estimated waste volumes were determined for the two major waste streams (one generated hazardous solid waste and the other non-hazardous solid waste) that would be generated during refining operations. The estimated waste volumes for the hazardous waste solids generated from one of these two streams associated with the WWTU resulted in the refinery being classified as an LQG. Therefore, these waste volume determinations were sufficient for determination of the generator classification. As an LQG, the refinery would comply with the regulatory requirements shown on Table 7-2.

Table 7-1 Hazardous Waste Generation Classification and Applicable Regulations

Generator	Quantity	Regulation
Large Quantity (LQG)	$\geq$ 1,000 kg/month (approximately 2,200 lbs) > 1 kg/month acute (approximately 2.2 lbs) > 100 kg residue or contaminated soil from cleanup of acute hazardous waste spill)	All Part 262 Requirements
Small Quantity (LQG)	Between 100-1,000 kg/month (approximately 220-2,200 lbs)	Part 262, Subparts A,B,C (262.34(d) is specific to SQGs);and Subparts E,F,G,H if applicable; and portions of Subpart D as specified in 262.44.
Conditionally Exempt Small Quantity Generator (CESQGs)	$\leq$100 kg/month $\leq$1 kg/month of Acute Hazardous Waste <100 kg/month of Acute Spill Residue or Soil	Part 261.5

Source: U. S. Environmental Protection Agency 2003a

Waste determinations, to the extent possible, were based on the requirements of regulation 40 CFR 261.5(c) and (d).

Table 7-2 Large Quantity Generator Requirements

Component	Requirement
Quantity Limits	>1000 kg/month >1 kg/month of Acute Hazardous Waste >100 kg/month of Acute Spill Residue or Soil 40 CFR 262 and 261.5(e)
EPA ID Number	Required 40 CFR 262.12
On-Site Accumulation Quantity	No Limit
Accumulation Time Limits	<90 days — 40 CFR 262.34(e)
Storage Requirements	Full Compliance for Management of Tanks, Containers, or Containment Buildings 262.34(a)
Off-Site Management of Waste	RCRA Permitted/Interim Status Facility — 40 CFR 262.20(b)
Manifest	Required 40 CFR 262.20
Biennial Report	Required 40 CFR 262.41
Personnel Training	Required 40 CFR 262.34(a)(4)
Contingency Plan	Full Plan Required 40 CFR 262.34(a)(4)
Emergency Procedures	Required 40 CFR 262.34(a)(4)
DOT Transport Requirements	Yes 40 CFR 262.30-262.33

Source: U. S. Environmental Protection Agency 2005f

The following wastes were not included in the identification of hazardous waste to be counted (40 CFR 261.5(c)):

a) waste exempt under 40 CFR 261.4 (c) through (f), 261.6 (a)(3), 261.7 (a)(1) or 281.8;
b) waste immediately managed upon generation only in on-site elementary neutralization units, waste water treatment units, or totally enclosed treatment facilities as defined in 40 CFR 260.10;
c) waste that is recycled, without prior storage or accumulation, only in an on-site process subject to regulation under 40 CFR 261.6(c)(2);
d) waste that is a used oil managed under the requirements of 40 CFR 261.6 (a)(4) and 40 CFR part 279;
e) waste that is a spent lead-acid battery managed under the requirements of 40 CFR part 266, subpart G; or
f) waste that is Universal Waste managed under 40 CFR 261.9 and 40 CFR part 273.

In addition, to avoid double counting, the determination of the quantities of hazardous waste did not include the following, since the wastes were already accounted for when they were originally generated (40 CFR 261.5 (d)):

a) waste when it is removed from on-site storage;
b) waste produced by on-site treatment (including reclamation) of the refinery's hazardous waste, as long as the hazardous waste that is treated was counted once; or
c) Spent materials that are generated, reclaimed, and subsequently reused on-site, as long as such spent materials have been counted once.

Chapter 8 — RCRA Permit Determination

A RCRA permit is generally required for a facility that operates a facility where regulated hazardous waste is treated, stored, or disposed (TSD), as defined in the RCRA regulations. These facilities are referred to as TSD facilities, or TSDFs. However, under some conditions a RCRA permit is not required. To determine whether a hazardous waste permit would be required for the MHA refinery, a preliminary assessment was made of the types and volumes of waste anticipated to be generated and planned onsite treatment, storage, and disposal activities for these wastes. Also, a determination of applicable WWTU exemptions under various operational scenarios will be made by EPA as part of the final EIS. A brief summary of permits likely required for each wastewater discharge alternative, as discussed in Chapter 2 of the draft EIS, is provided below. Also, a detailed explanation of permits required for various discharge scenarios is provided in the ““Discussion of Regulatory Applicability of RCRA/NPDES/UIC to Three Affiliated Tribes Refinery Alternatives” (May 2006) (Regulatory Applicability Discussion).

A RCRA TSDF permit would be required for all discharge alternatives under Alternative 1 due to the use of surface impoundments, and/or non-applicability of the WWTU exemption. This is due to the following considerations:

Alternative 1&A: Surface impoundments do not meet the definition of tanks or tank systems, and the upstream surface impoundment would generate FO37;

Alternative 1&B: A RCRA TSDF permit is required because the proposed irrigation is not covered by an NPDES permit which is required to obtain the WWTU exemption; Surface impoundments do not meet the definition of tanks or tank systems, and the upstream surface impoundment would generate FO37;

Alternative 1&C: A RCRA TSDF permit is required because the proposed UIC disposal is not covered by an NPDES permit as required to obtain the WWTU exemption; Surface impoundments do not meet the definition of tanks or tank systems, and the upstream surface impoundment would generate FO37;

Under Alternative 4, a RCRA TSDF permit would not be required for Alternative 4&A. A RCRA TSDF permit would likely be required for Alternatives 4&B and 4&C. This is due to the following considerations:

Alternative 4&A: A RCRA TSDF permit is not required due to the proposed use of tanks and tank systems in the WWTU in conjunction with an NPDES discharge permit- this meets the requirements for the WWTU exemption;

Alternative 4&B: A RCRA TSDF permit is likely required because the proposed irrigation is not covered by an NPDES permit as required to obtain the WWTU exemption;

Alternative 4&C:. A RCRA TSDF permit is likely required because the proposed UIC disposal is not covered by an NPDES permit as required to obtain the WWTU exemption;

This is summarized in Table 8-1 below:

Discharge Alternatives	EPA Permits Required
1&A	NPDES and RCRA
1&B	NPDES and RCRA
1&C	NPDES, RCRA, and UIC
4&A	NPDES
4&B	NPDES and RCRA
4&C	NPDES, RCRA, and UIC

Table 8-1 Summary of RCRA / NPDES / UIC Permits Required

As discussed in Chapter 4 (Solid Waste Generation), the lack of detailed engineering at the current time creates uncertainties as to the types and amounts of hazardous waste that would be generated in the proposed refinery. The major issue is that different alternatives are still being considered for treatment and disposal of wastewaters, which could have a significant impact on the regulation of waste that would be generated. Under Alternative 1, a RCRA permit would be required due to the use of the up-stream holding pond. Under Alternative 4&A, tanks are used instead of holding ponds and the facility could avoid having to obtain a RCRA permit depending upon the design and operation of the WWTU.. With carefully designed facilities and operating procedures, and compliance with specific hazardous waste exemptions available under RCRA (e.g., wastewater treatment unit exemptions), it would be possible to properly manage hazardous waste without a RCRA permit. However, RCRA generator requirements would apply.

The refinery wastewater treatment system would serve as the largest continual generator of hazardous waste in the refinery. In addition to the refinery wastewater treatment system, other treatment and disposal options are being considered in an effort to optimize water reuse and minimize potential impacts on the environment.

As discussed in Chapter 2 of the draft EIS, the discharge alternatives being considered consist of the following:

- Wastewater treatment in a conventional wastewater treatment system, with discharge to surface waters via an NPDES Permit.
- Partial discharge to surface waters via an NPDES Permit, with some onsite storage and irrigation
- Injection of treated nonhazardous wastewater from the wastewater treatment system into a Class I injection well via a Underground Injection Control (UIC) Permit.

The required handling and permitting of, hazardous waste generated by the refinery would be significantly affected by these different alternatives. There would be significantly more requirements under a RCRA TSDF permit.

NPDES Permit Discharge

NPDES Point Source Discharge of All Effluent

The proposed action for treatment and discharge of wastewater is the treatment of waste water by means of a conventional WWTU. The treated non-hazardous wastewater would be discharged to surface waters as a point-source discharge subject to regulation under Section 402 of the Clean Water Act (CWA). Under some discharge scenarios, the WWTU would be RCRA-exempt.

Partial Discharge through an NPDES Permit and Some Storage and Irrigation

Under this alternative, wastewater would be treated in the WWTU and then stored in the ponds or tanks on the west side of the facility. The MHA Nation would discharge water as described above for the all-effluent alternative during times when irrigation is not possible. During the growing season when saturated soil conditions do not exist, the refinery would use treated waste water to irrigate trees, other vegetation, and forage on the project site. With this alternative, the MHA Nation would irrigate when possible, but also would be able to discharge with conditions for irrigating are not optimal (See discussion concerning use of wastewater for irrigation below).

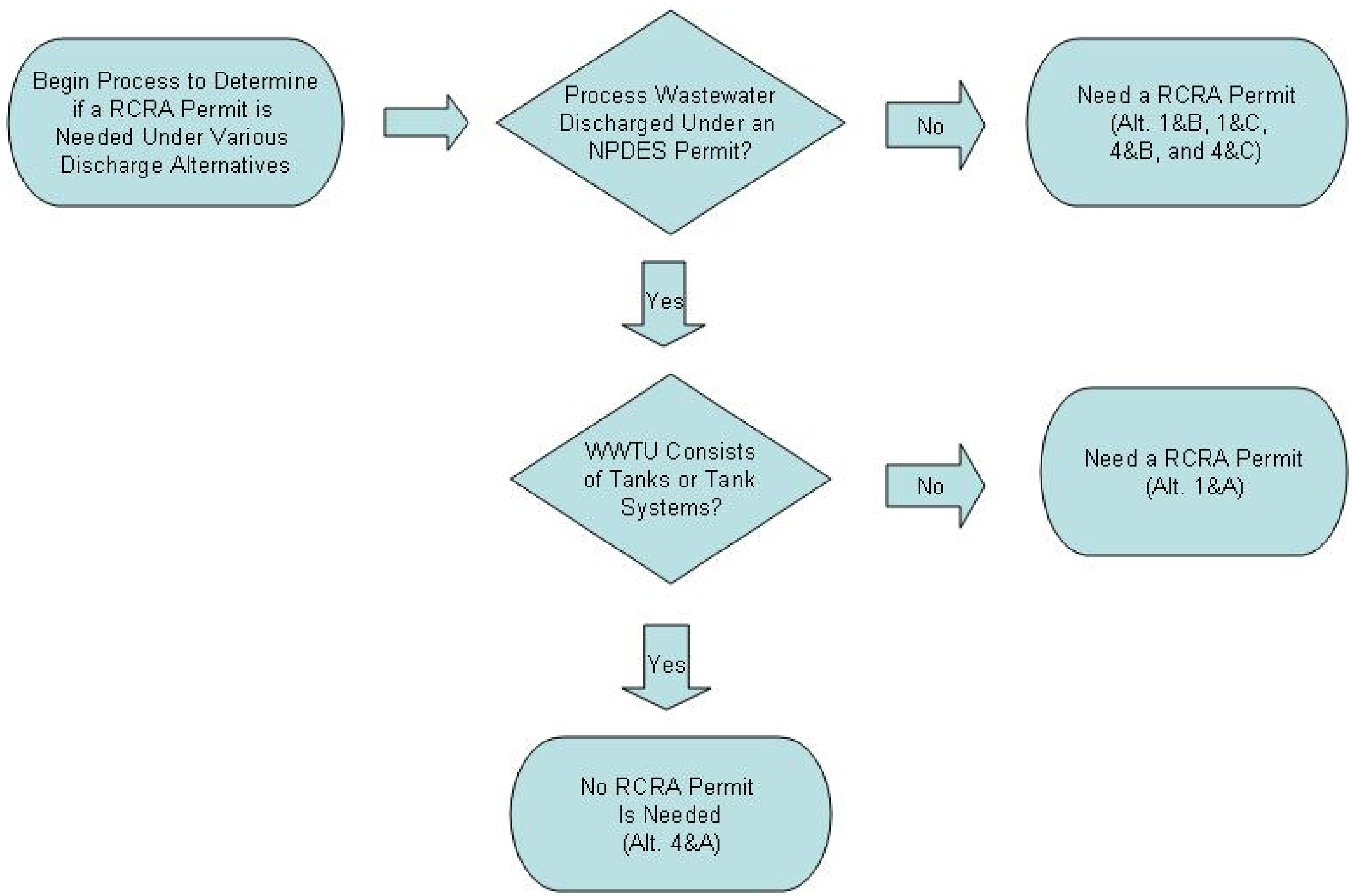
RCRA Permit Issues for an NPDES Permitted Discharge

Under Alternative 4&A, a RCRA TSD permit may not be required for the operation of the NPDES permitted WWTU or other hazardous waste management activities in the refinery. The basis for this determination is discussed below. However, an inability to meet and adhere to these findings could result in the requirement to acquire a RCRA TSD permit. A final determination of whether a RCRA TSD permit would be required for the WWTU, or other refinery waste activities, would be made once the final design and operating procedures have been completed, waste streams have been better defined for each process unit, and concurrence has been reached with the EPA.

The rationale for taking the position that a RCRA permit would not be required is as follows:

- The WWTU exemption would apply as the WWTU would consist of tanks and tank systems and wastewater would be discharged through an NPDES permit.
- Additional considerations:
- Hazardous waste that would be generated by the refinery and transported offsite for treatment or disposal would not be stored onsite for long periods of time (not greater than 90-days) that would trigger the requirement to obtain a RCRA TSD permit. As a LQG, the refinery would not store hazardous wastes onsite for more than 90 days, except where storage periods may be extended as permitted by the regulations.

Figure 8-1 General Flowchart of Wastewater Discharge Alternatives and RCRA Permitting *-Solid and Hazardous Waste Management Report, MHA Nation Refinery EIS -* (EPA, May 2006)



- No hazardous waste would be disposed of onsite (i.e., landfill or land-farm (a.k.a., a land treatment unit or LTU)).
- No hazardous waste would be accepted from off-site.
- Hazardous waste would be treated onsite only in a manner that would be in compliance with exemptions and exclusions available under RCRA regulations so that a RCRA TSD permit would not be required:
  - Large volume wastes, such as process catalysts, would be regenerated and/or recycled as allowed by RCRA regulations in order to avoid being classified as a solid waste and handled as a viable material.
  - Recovered oil from the refining operations (for example, the heavy slop tank) would be recycled to the crude unit for reprocessing, thereby complying with a RCRA exclusion (40 CFR 261.4(a)(12)(ii)).
  - Hazardous waste waters would be treated in the WWTU, with the treatment units being exempt from RCRA permitting requirements (40 CFR 264.1(g)(6)). The WWTU exemption would allow the refinery to treat and store hazardous waste water and sludge in a "tank or tank system" (40 CFR 260.10) that is part of the WWTU (subject to Section 402 of the CWA) without a RCRA permit. API previously reported that 35 of 46 refineries reported managing all of their wastewaters in exempt wastewater treatment tanks (American Petroleum Institute 1996).
  - Sludges generated in aggressive biological treatment units, as defined in 40 CFR 261.31(b)(2) (including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units), are not considered hazardous wastes (40 CFR 261.31). Without such treatment, such waste would be deemed a hazardous waste — Petroleum Refinery Primary oil/water/solids separation sludge (F037) and Petroleum Refinery Secondary (emulsified) oil/water/solids separation sludge (F038) that would be generated would be deemed to be a hazardous waste.

    Aggressive biological treatment units employ one of the following four treatment methods:

    - activated sludge;
    - trickling filter;
    - rotating biological contacter for the continuous accelerated biological oxidation of wastewaters; and
    - high-rate aeration (40 CFR 261.31(b)(2)(i).

    The MHA refinery would use high-rate aeration, which would be a system of tanks in which intense mechanical aeration would be used to completely mix the wastes, enhance biological activity, and:

    - employ a minimum of 6 hp per million gallons of treatment volume (40 CFR 261.31(b)(2)(i)(A)); and either
    - the hydraulic retention time of the unit would be no longer than 5 days (40 CFR 261.3(b)(2)(i)(B)); or
    - the hydraulic retention time would be no longer than 30 days and the unit would not generate a sludge that is a hazardous waste by the Toxicity Characteristic leaching procedure (40 CFR 261.31(b)(2)(i)(C)).

The supplier and manufacturer of the waste water treatment units would be required to meet these requirements as part of the design specifications. Refinery operating procedures would provide the procedures necessary to ensure the aeration rates and retention times are maintained and the required documents and data are maintained to demonstrate that the waste water treatment units are operated as required (40 CFR 261.31(b)(2)(ii)(A)) and the sludges sought to be exempted from the definitions of F037 and F038 were actually treated in the aggressive biological treatment unit (40 CFR 261.31(b)(2)(ii)(B)). If the ABTU is not operated in accordance with these requirements, FO37/FO38 could be generated in the ABTU and in all units downstream of the ABTU. That could cause downstream units to be regulated as Hazardous Waste Management Units (HWMUs) requiring a RCRA TSDF permit.

- Closed process sewer lines conveying oily water containing benzene (the benzene process closed drain) would be treated in an enclosed stream stripper, with recovered benzene and other volatile organic compounds returned to the process. A closed process drain would also be used to convey sour water via a closed process drain to an enclosed sour water stripper, where a sulfur stream would be sent to the sulfur recovery unit. The stripped waste water in both units would be recycled within the refinery or sent to the waste water treatment system. The waste in these units would be recycled and treated in a totally enclosed unit, and would therefore, be exempt from RCRA permitting requirements. Stormwater would be separated from process wastewater, so that sludges generated in the stormwater units that do not receive dry weather flow would not be considered as hazardous waste.
- Elementary neutralization units (e.g., spent caustic solution neutralization pit) utilized by the refinery would qualify for a RCRA exemption (40 CFR 264.1(g)(6)) because it would only exhibit the characteristics of corrosivity (D003) and would be constructed to meet the definition of a “tank.” If the waste stream exhibited any other hazardous waste characteristic, or wastes meeting any of the listing descriptions, then the exemption would not apply.

➢ Hazardous items such as recycled batteries, pesticides, mercury switches and thermostats and lamps would be handled as universal wastes, thereby exempting such materials from treatment, storage, disposal facility permitting requirements.

➢ In addition to the wastewater treatment system discussed above, the engineering design basis for the refinery would include the requirements for designing and installing all process and other ancillary equipment in a manner that would allow the refinery to comply with the various wastewater treatment unit and other RCRA exemptions. In addition, operating procedures for all applicable equipment would be developed to ensure operations are conducted in a manner to allow compliance with the various exemptions.

Partial Discharge through an NPDES permit and Some Storage and Irrigation

Under this alternative, waste water could be treated in the WWTU and then stored in the ponds on the west side of the facility. During the growing season, the treated water could be pumped from the storage ponds, after appropriate treatment (which could be required under a RCRA TSD permit), and used for irrigating buffalo forage, trees, and other vegetation on the project site.

This alternative is predicated on the project design limiting the amount discharge from the WWTU to an average of 10 gpm or less. The 10 gpm of treated effluent would be applied to dedicated irrigation land. During the winter months, the effluent would be contained in the holding ponds and evaporation pond on the west end of the project site. Conversely, during the growing season of approximately May 1 to September 15, the treated effluent would be exported via a pipeline and used for irrigation of trees and seasonal row crops. It is assumed in this analysis that the land area within Section 20 is adequate to grow seasonal buffalo forage and receive the project effluent volumes.

The following example illustrates the amount of waste water generated and amount of irrigation land required to land apply the 10 gpm effluent stream. The evaporation and three holding ponds have the capacity to store 11.7 million gallons of water. A 10-gpm waste water effluent stream would generate a volume of 5,126,400 gallons annually. Therefore, the total annual wastewater effluent discharge would occupy about 44 percent of the storage volume of the four ponds. For this analysis, we assume that a 279-acre land area would be irrigated using a linear move hose-fed system, with one-inch of water applied over an 8-hour period. Based on these assumptions, approximately 1,081,862 gallons would be used for irrigation on the 40-acre land parcel on a daily basis during non-precipitation days. It is important to note that the soils present in the project area have a minimum soil permeability of 0.6 inches per hour. Therefore, the maximum amount of water applied to the land cannot exceed more than 0.6 inches of water during non-precipitation days.

The refinery wastewater is considered to be (by definition) a solid waste under RCRA. As such, all wastewater proposed to be used for irrigation should be treated to meet appropriate standards to protect human health and the environment. In addition, unless the wastewater is treated sufficiently, it will continue to be considered a solid waste containing hazardous waste constituents, and RCRA corrective action requirements would apply for the irrigated land parcel. This is because the irrigated land parcel would be considered a SWMU. Therefore**,** a RCRA TSD permit may establish additional treatment levels for irrigation water.

While land application of wastewater could result in classification of the irrigated land as a RCRA Land Treatment Unit (LTU) pursuant to 40 CFR Part 264, Subpart M if not treated properly, the refinery proponents do not intend to dispose of hazardous waste in an LTU and could treat (in accordance with the RCRA permit) the wastewater to levels that would preclude possible LTU classification for the irrigated land parcel. Additional treatment levels could include the RCRA Land Disposal Restriction (LDR) treatment levels in 40 CFR Part 268 and human food-chain considerations.

It is not currently possible to establish treatment level standards because it is not yet known what hazardous waste constituents (and their respective concentrations) would be in the wastewater. That information should be developed as part of the final facility design and could potentially be submitted as part of a RCRA TSD permit application. At that time, a determination of what is appropriate wastewater quality for irrigation would be made after conducting some type of risk assessment. Based on the information submitted in the RCRA TSD permit application, EPA could also determine whether the irrigated parcel would be considered an LTU. For example, if the metals were to accumulate in soils or if RCRA characteristic or listed wastes were land applied, the irrigated parcel would likely become an LTU. If this were true, there would be greater likelihood of releases to soils, ground water, surface water, and related human-food chain considerations.

Regulatory requirements for LTUs are found at 40 CFR Part 264 and include: preparedness and prevention actions, a land treatment program, design and operating requirements, food-chain crop requirements for protection of human health, unsaturated zone monitoring, groundwater monitoring, financial assurance, corrective action, and closure and post-closure care. In addition, if the irrigated land parcel becomes an LTU, future land use options could be affected.

As indicated above, if the wastewater is treated to levels that preclude regulation of the irrigated land parcel as a hazardous waste LTU, it still may be considered a RCRA land application unit (LAU) if the wastewater is considered a RCRA solid waste. LAUs must meet the requirements of 40 CFR Part 257 which implements the RCRA Subtitle D solid waste program. RCRA corrective action requirements would apply for any releases of any hazardous waste constituents.

RCRA Permit Issues for Non-Permitted NPDES Options

Non-NPDES options (irrigation and UIC options) for discharge of wastewaters will likely be subject to a RCRA permit. There are two basic requirements that a WWTU must meet to be excluded from RCRA permitting requirements:

- the discharge must be subject to Clean Water Act (CWA) permitting requirements, or pretreatment standards, under CWA 40 CFR 402 or 307(b);
- the WWTU must meet the RCRA definition of a tank or tank system.

Therefore, the WWTU exemptions could not be used for non-NPDES options. However, there are a number of ways that a generator may be allowed to treat hazardous waste without first obtaining a hazardous waste treatment permit. Examples include the following:

- Exempt Treatment Options
    - Totally enclosed treatment unit exemption
    - Elementary neutralization unit exemption for corrosive-only waste streams

    Explanations of these exemptions are discussed further in this section.

- Land Disposal Restrictions

    Hazardous wastes that are considered to be corrosive and/or exhibit other hazardous waste characteristics and/or are listed hazardous waste may be treated without first obtaining a RCRA treatment permit if the treatment is for the purpose of achieving compliance with a land disposal restriction treatment standard (40 CFR Part 268). Treatment to meet a land ban restriction treatment standard may be conducted in a generator's accumulation tank or container, pursuant to the generator accumulation exemption of 40 CFR 262.34. This provision allows hazardous waste generators to treat or store such wastes in tanks or containers for short periods of time (e.g., 90 days), providing all conditions of 40 CFR 262.34 are met, including compliance with specified tank or container requirements of 40 CFR Part 265.

A final determination of the RCRA permit requirements and possible viable exemptions for the MHA Refinery will need further assessment once more detailed design, operational and waste characterization information have been prepared for the WWTU and other refinery operations (MSM 2005). Since some uncertainty exists as to the need for a RCRA permit, the basic requirements of applying for, and implementing, a RCRA permit for operations of the refinery are discussed below. With or without a RCRA permit, the refinery should manage all hazardous waste in a responsible manner that will adequately protect the environment, workers and public.

RCRA Permit Requirements

If it is determined that specific exclusions from RCRA permit requirements would not apply to the refinery operations, then a permit could be required for specific hazardous waste treatment, storage and disposal facility (TSDF) activities, as defined in 40 CFR 260.10. The RCRA permitting requirements are found in 40 CFR parts 264 and 270. In order to obtain RCRA permit, a comprehensive permit application covering all aspects of the design, operation and maintenance of the facility must be submitted to the EPA. A permit application would address the specific geography of the facility, the types of hazardous waste management units, unit-specific requirements, the specific waste streams to be managed at the facility, closure and financial assurance standards, and any applicable ground water monitoring and air emissions provisions (U. S. Environmental Protection Agency 2003b).

A RCRA permit application would consist of two parts, Part A and Part B. The major steps for the permitting of a new facility are shown on Figure 8-2. Parts A and B must be submitted simultaneously, with submittal to EPA occurring at least 180 days prior to the date on which physical construction is expected to begin (40 CFR Part 270.10 (f)) (U. S. Environmental Protection Agency 2003b). Construction of a treatment, storage or disposal facility cannot begin until the application has been reviewed and a final permit issued.

Part A

The Part A application consist of completing designated Form 8700-23, which includes information such as (U. S. Environmental Protection Agency 2005e):

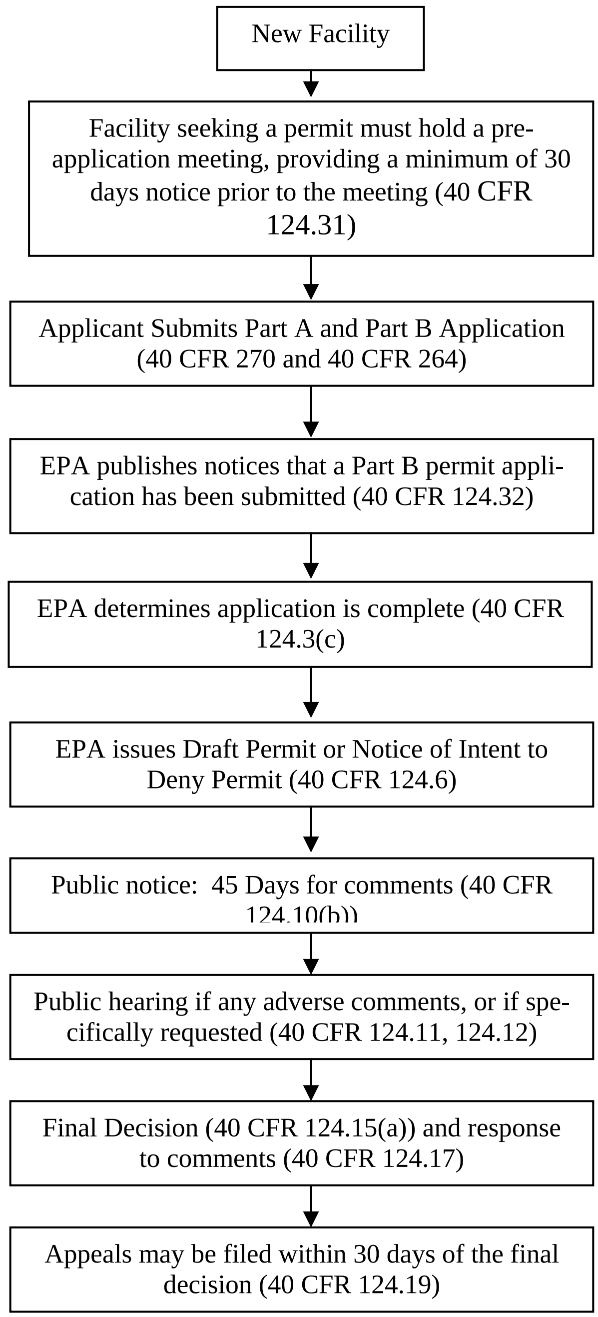
- activities to be conducted that require the filing of a permit application;
- name, mailing address, and location of the facility;
- facility phone number
- up to four North American Industry Classification System (NAICS) codes that best describe the facility activities;
- descriptions of the processes to be used for treating, storing and disposing of hazardous waste and the design capacity of these items or units;
- identification of all permits received or applied for under other regulatory programs; and
- topographic map of the facility.

Part B

The Part B application is submitted in narrative form, providing site-specific information associated with the waste management activities that would be conducted at the facility. This application covers the details associated with the waste management activities that would occur at the facility, and therefore typically consists of several volumes of documents. The Part B application would consist of information required un 40 CFR Parts 264 and 270 including the following information (U. S. Environmental Protection Agency 2003b):

- general facility information
- general facility standards
- operations and maintenance
- analyses of waste to be managed
- facility security procedures
- inspection schedule
- training
- preparedness and prevention
- contingency and emergency response
- manifest systems, recordkeeping and reporting

- releases from solid waste management units
- ground water monitoring
- corrective action
- procedures and precautions to prevent release of waste into environment
- procedures and precautions to prevent accidental ignition or reaction of waste
- closure and post-closure care
- financial assurance requirements
- use and management of containers
- tank systems
- surface impoundments
- land treatment units (if applicable)
- special provisions for cleanup
- air emission standards



Source: U. S. Environmental Protection Agency 2005c

Figure 8–2 Major Steps in the RCRA Permitting Process

Three issues associated with a TSDF worthy of some discussion are financial assurance, ground water monitoring, and contingency plan and emergency procedure requirements. These are important issues due to the financial liability to the owner/operator, risk to local and area water supplies and risk of release of hazardous waste or hazardous constituents to air, soil, or surface water in the event of a fire, explosion, or an unplanned sudden or non-sudden release.

Financial Assurance

There are closure and post-closure requirements associated with RCRA permits that are designed to protect human health and the environment from long-term threats associated with hazardous waste management and permanent disposal. Closure and post-closure regulations are composed of two parts: general standards applicable to all TSDFs and the technical standards for specific types of hazardous waste management units (e.g., onsite landfills). Many of the actual implementation requirements come at the end of a facility's waste management operations and can be very expensive. Facilities with RCRA permits for TSDF facilities must demonstrate that they have the financial resources to properly conduct closure and post-closure in a manner that protects human health and the environment (U. S. Environmental Protection Agency 2003b). In addition, the regulations require that TSDF owners and operators demonstrate that they have the financial resources to pay for bodily injury or property damage that might result form waste management activities. Cost estimates for financial assurance is based on what it would cost for a third-party contractor to close the facility.

Liability financial assurance coverage amounts apply on an owner or operator basis, not on a per facility basis. So, regardless of the number of facilities, the owner or operator must provide $1 million per occurrence and $2 million annual aggregate for sudden accidental occurrences and $3 million per occurrence and $6 million annual aggregate for non-sudden accidental occurrences (if applicable). The latter non-accidental occurrences apply only to land-based units (e.g., hazardous landfills).

Financial assurance must be maintained until closure and post-closure is no longer required. Closure cost estimates are based on the point in time in the facility's operating life when closure would be the most expensive. Post-closure estimates are based of cost estimates for an entire post-closure period of 30 years, unless reduced or extended by the regulatory agency. Closure and post-closure cost estimates must be adjusted annually to account for inflation until closure is completed.

Experiences at various TSDF sites in the U.S. has shown that closure and post-closure financial requirements can cost up to tens of millions of dollars and more, depending on the location and degree and type of contamination. The MHA Refinery would not have onsite permanent land-based hazardous waste disposal facilities, using third-party, off-site permitted disposal facilities for any hazardous waste disposal. This action would result in reduced liabilities, but the potential for releases of hazardous constituents to the environment during the operating life of the facility could pose as a sizeable financial liability.

Therefore, it is very important for waste to be managed properly, with prevention measures being a critical action.

The EPA allows owners and operators to use the following financial assurance mechanisms:

- trust fund;
- surety bond (two types)
  - payment bond
  - performance bond
- letter of credit;
- insurance;
- financial test; and
- corporate guarantee.

For companies with sizeable financial strength, mechanisms that do not require ongoing expenses for maintaining financial assurance, mechanisms such as a financial test or corporate guarantee, can be used (documentation of adequate financial resources to cover liability issues). Others without such financial strength are required to use mechanisms that require ongoing, annual expenses for the appropriate coverage.

Ground Water Monitoring

The treatment, storage and disposal of hazardous waste at a refinery site creates the potential for the generation of hazardous waste contamination that can transport hazardous contaminants into valuable sources of ground water, especially aquifers used for drinking water supplies. To avoid such contamination of valuable resources and to help avoid costly cleanups, a RCRA TSD permit (under 40 CFR 264 Subpart F) requires TSDF facilities with land-based treatment, storage or disposal facilities (i.e., land treatment units, landfills, surface impoundments and waste piles) to monitor ground water under their facilities to ensure that their hazardous waste management activities are not contaminating the ground water (U. S. Environmental Protection Agency 2003b). If releases to groundwater are detected, corrective actions must be taken. There are some waivers and exemptions available for ground water monitoring, e.g., units that do not have the potential to leak hazardous waste into the environment.

Owners that are required to monitor ground water must install monitoring wells to detect contamination in the aquifer nearest the ground surface as soon as possible. To meet this requirement, the TSDF facility must have enough wells in the right locations to represent the ground water conditions under the facility accurately, using properly installed wells and consistent and representative sampling and analytical procedures. If the refinery is required to obtain a RCRA TSD permit, ground water monitor wells would be installed to meet applicable RCRA requirements for the hazardous waste activities onsite. RCRA typically requires one-year of ground water monitoring data prior to use of HWMUs.

If the MHA Refinery is not required to obtain a RCRA permit, plans would be to use ground water monitoring to serve as early detection of any potential contamination associated with waste management activities. Five shallow monitor wells and five deep piezometers (1 shallow and 1 deep well at 5 locations) have been installed around the perimeter of the proposed refinery site to establish baseline ground water conditions. Plans would be to continue to use these wells for monitoring during operations. Once the refinery design and layout have been finalized, the site would be evaluated for the potential need for additional monitor wells that can be used to monitor ground water quality in waste management areas, as well as refinery operational areas, considered to be of higher risk to potential spills and/or releases.

Contingency and Emergency Response

Facilities with a RCRA permit, as well as LQGs without a RCRA permit, are required to prepare and implement a RCRA contingency plan and emergency procedures in the event of a spill or release of hazardous waste or hazardous constituents (40 CFR 265 Supart C and D). The contingency plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water (40 CFR 265.51(a)). The provisions of the plan are to be implemented immediately when there is a fire or a release of hazardous waste or hazardous waste constituents that could threaten human health or the environment (40 CFR 265.51(b)). The required contents of the plan are presented in 40 CFR 265 Subpart D — contingency plan and emergency procedures. Compliance must always also be with 40 CFR Subpart C — Preparedness and Prevention. Under this subpart, facilities must be maintained and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water that could threaten human health or the environment. Facilities must have required equipment, testing, and maintenance of equipment to assure proper operation, required aisle space for unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency (40 CFR 265.32 – 265.35). Arrangements must be made with local authorities, including police, fire departments, and emergency response teams to familiarize them the layout of the facility, properties of hazardous waste handled on site and associated hazards, places where facility personnel would normally be working, entrances to roads inside the facility and possible evacuation routes (40 CFR 265.37). To the extent possible, arrangements should be made with state emergency response teams, emergency response contractors and equipment suppliers, as well as arrangements to familiarize local hospitals with the properties of hazardous waste handled at the facility and the types of injuries or illnesses which could result from fires, explosions or releases at the facility (40 CFR 275.37).

As per 40 CFR 265.52, a facility that has already prepared a Spill Prevention, Control and Countermeasures (SPCC) Plan may amend this plan to incorporate hazardous waste management provisions that are sufficient to comply with the requirements of 40 CFR part 265, Subpart D.

The MHA Refinery, as an LQG, would comply with 40 CFR parts 262.34(a)(4) and 265. The refinery would be subject to a number of spill and release reporting requirements of different environmental statutes. These requirements, as well how the refinery would address the development of response plans, are described in Appendix 3. To the extent feasible, the refinery would attempt to develop a single, or as few as possible, emergency response plan(s) that would meet all of the requirements of the different statutes.

RCRA Corrective Action

EPA's RCRA Corrective Action Program (40 CFR 264.101) requires the investigation and cleanup, or remediation, of any releases from SWMUs of hazardous waste or hazardous constituents to all environmental media. (U. S. Environmental Protection Agency 2003b). Facilities are typically brought into the RCRA corrective action process when there is an identified release of hazardous waste or hazardous constituents or when the EPA is considering a facility's RCRA permit application.

If the MHA Refinery was operating as a non-permitted RCRA facility and had a release of hazardous wastes or constituents, in addition to response measures required as part of the contingency plan under 40 CFR Part 265, Subpart D, it may be able to use the RCRA corrective action process in a voluntary cleanup. Such cleanups would be best carried out with oversight by the EPA. In cases where there are potential imminent and substantial risks, or investigations are needed, the EPA may issue an administrative order. In both of these cases, a RCRA permit would not be required. Another alternative would be the use of a special form of RCRA permit, such as an emergency permit. The emergency permit is issued when the EPA determines that an imminent and substantial endangerment to human health or the environment has occurred. Such a permit may be issued to a non-RCRA permitted facility in order to allow treatment, storage, or disposal of hazardous waste. The permit can only be used for a period of 90 days or less. Continued hazardous waste treatment activities beyond 90 days after the immediate response is over could require a RCRA permit (40 CFR 261.6 (c)). A RCRA corrective action order (RCRA 3008(h)) or a RCRA emergency order (RCRA 7003) could also be used if applicable. If the facility has a RCRA permit, corrective action would be required in accordance with 40 CFR 264.101.

UIC Well

Underground Injection Control (UIC) wells are regulated under the Safe Drinking Water Act (SDWA) and RCRA (for hazardous waste). There are five basic types of injection wells that require a permit, which are defined (40 CFR 146.5) according to the type of fluid injected and where the fluid is injected (U. S. Environmental Protection Agency 2005a). Each class of well has different requirements and standards, with Class I and some Class II wells having the highest standards.

- Class I — wells used to inject hazardous and non-hazardous wastes below the lowermost underground source of drinking water (considered as deep wells).
- Class II — oil and natural gas brine disposal, enhanced recovery and liquid hydrocarbon storage wells.
- Class III — wells that inject for extraction of minerals including solution mining of uranium, salts, and potash.
- Class IV — wells that inject hazardous or radiological wastes into or above underground sources of drinking water (these types of wells are banned because of direct threats to public health).
- Class V — injection wells that are not included in the other classes of wells (generally these are shallow wells).

The type of waste that would be disposed of by the MHA refinery would be non-hazardous waste water that has been treated in a conventional refinery waste water treatment system. The applicable class of well for this type of waste would be a Class I non-hazardous waste well.

Class I injection wells are located such that they inject fluids below the lowermost underground source of drinking water and have a confining zone above an injection zone located within a quarter mile of the well, an Underground Source of Drinking Water (USDW) (U. S. Environmental Protection Agency 2005b). Injection zone reservoirs typically range in depth from 1,700 to more than 10,000 feet below the surface. Petroleum refining is one of the main industrial sectors that use Class I wells.

In addition to the siting requirements, there are specific operating and monitoring requirements that must be met by Class I well owners and operators, with the requirements being more stringent for hazardous wells. To obtain approval for the operation of a Class I well, the following requirements must be met:

- proper design of the well to ensure that the waste will not migrate into an underground source of drinking water;
- assurance that the injection pressure does not cause fractures in the injection zone or migration of fluids;
- provide plans for closing the well and post-closure care;
- demonstrate and maintain financial assurance (trust fund, bond or other approved forms) to ensure that the well can be properly plugged and abandoned;
- establishment of monitoring and reporting requirements; and
- for Class I hazardous waste wells, demonstration that the injected waste will not migrate beyond the injection zone for 10,000 years [not applicable to non-hazardous waste Class I wells].

For Class I "hazardous" wells, a non-migration petition is required, which is to demonstrate that the hazardous components of the wastewaters will not migrate from the injection zone (40 CFR 148.20). The preparation of a no-migration petition is a lengthy process that can require up to 11,000 hours of technical work (U. S. Environmental Protection Agency 2001a). The total cost of required geological testing and modeling for a no-migration petition can cost in excess of $2,000,000. A Class I non-hazardous well does not require the no-migration petition. However, the Class I “non-hazardous” well may be required to demo,nstrate as appropriate, that the zone of endangering influence (AoR – radius in which injection can affect a drinking water supply aquifer) is at a minimum, one-quarter mile. (40 CFR 146.69(b)).

The construction and operation of a new injection well are prohibited until authorized by permit (40 CFR 144.31). The process for permitting and public comment for a Class I injection well is shown on Figure 8–3 (U. S. Environmental Protection Agency and Drinking Water Academy 2002).

EPA requires a Class I owner or operator to establish financial assurance to cover the cost of plugging and abandonment of the well. Each year, the owner or operator must review the cost estimate on which the financial assurance is based to determine whether it is still adequate to cover anticipated costs due to inflation and make any needed changes. Each year owners must also certify that the financial assurance is adequate and make any necessary changes to the type or amount of financial assurance.

Class I and V well permits are effective for a fixed term not to exceed 10 years. If a permit is reissued, the entire permit is reopened and subject to revision and the permit is reissued for a new term. The estimated time for the EPA review and approval process of a Class I non-hazardous disposal well is 6 months.

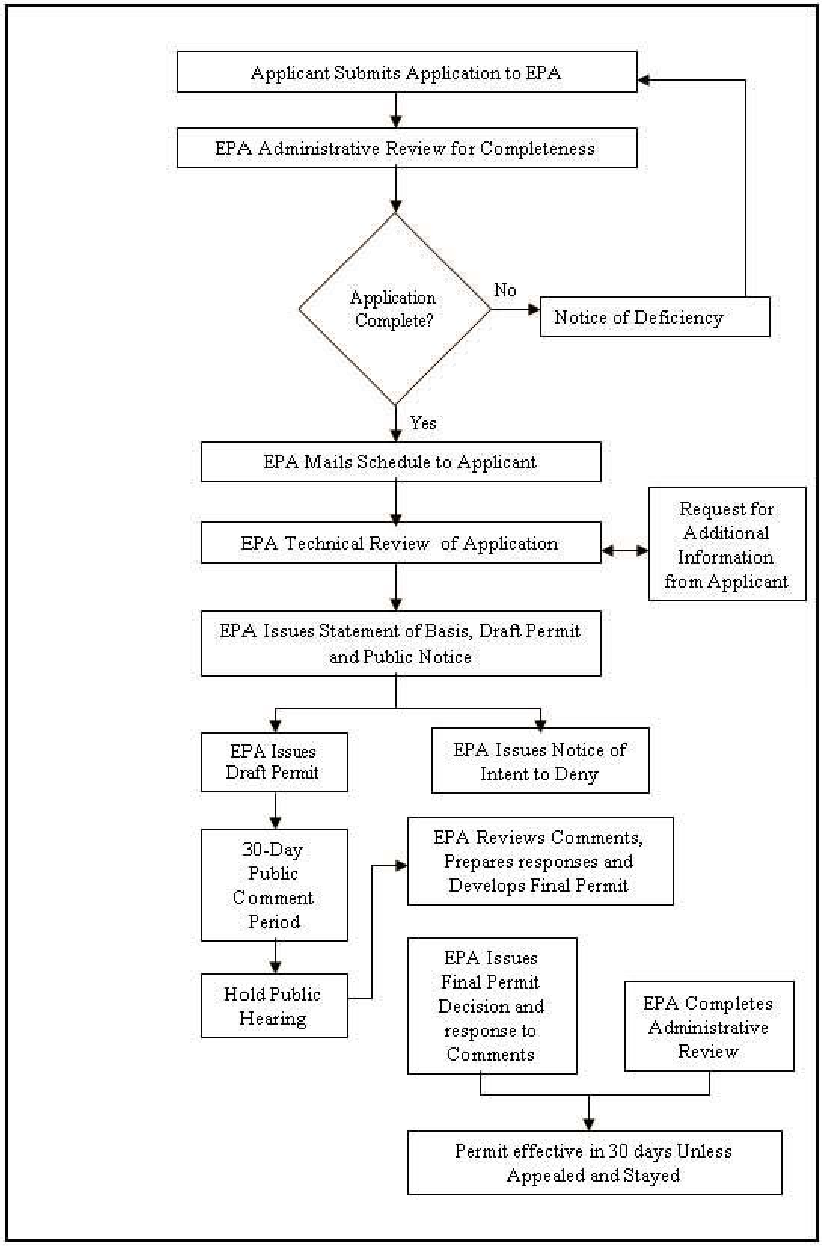


Figure 8–3 U. S. Environmental Protection Agency's Underground Injection Control Well Permitting Process

Chapter 9 — Impacts

As with any petroleum refinery, operations of the refinery would result in the generation of different kinds of solid waste residuals, both hazardous and non-hazardous. It is reasonable to expect some releases of hydrocarbons, metals, and other contaminants to soils and groundwater. Although the potential exists for impacts to air, land, and water, the refinery would have an advantage in being a newly constructed facility. This would result in the process and waste management equipment, facility layout, and operating procedures (including recycle and reuse opportunities) being designed to maximize the reduction or elimination of waste residuals, especially those considered to be hazardous. Examples of several of the design and operating conditions that would help to minimize solid waste generation were discussed in Chapter 6. A discussion of impacts under various alternatives is provided in the draft EIS document.

Until detailed engineering has been completed for the refinery (especially the wastewater treatment unit) and various waste treatment unit exemptions and other RCRA exemption options have been assessed, and until the final alternative is selected, a final determination cannot be made as to whether or not a RCRA permit would be required. With the proper facility design and operating procedures in place, the MHA Nation's refinery could possibly operate without a RCRA permit because of the manner in which the hazardous waste treatment, storage, and disposal activities would occur. This could be possible primarily because of the specific exclusions from permit requirements allowed under the RCRA regulations. However, even as a LQG without a RCRA permit (Alternative 4&A), the refinery would still be required to comply with specific parts of the RCRA regulations that would require programs and actions to properly manage hazardous waste and to adequately protect human health and the environment. If a RCRA permit is required, a number of additional requirements will be put in place to address potential impacts. Some of the key issues that would help to minimize the risks of potential release of solid waste residuals at the refinery to the environment are as follows:

a) No hazardous or non-hazardous solid wastes are planned to be disposed of on the refinery site, so there would be no landfills or landfarms (LTUs) that could pose as an onsite threat to air, soils, surface water and/or groundwater. This would change if the irrigated land parcel was classified as a LTU or LAU. An LTU ,in particular, could be reasonably be expected to pose a greater risk to human health and the environment (including potential impacts to soils, ground water and surface water).

b) In lieu of onsite disposal, non-hazardous and waste residuals would be shipped off site for recycling, reclamation, or disposal. Catalyst would be regenerated in place within the refinery process to the extent possible before removal and shipment off site.

c) Off-site disposal would only occur at properly licensed third-party facilities. For example, any hazardous wastes would be shipped to third-party sites that had the required state and/or federal hazardous waste permits and approvals. Prior to use of any third-party disposal site, an assessment would be made of their past and present performance and compliance record. Only those sites deemed to have acceptable performance and compliance records would be used.

d) Hazardous wastes that have been removed from equipment or other features, would be placed in containers acceptable for containing such waste and stored in designated waste management areas. These hazardous waste management areas would be designed as RCRA requirements so that any spills or releases would be contained (for example, concrete pad and curbing) to prevent releases to the environment. Hazardous wastes would be stored on site for less than 90 days prior to shipment to a licensed waste handling facility. The accumulation period would start when a hazardous waste is first placed in or on an empty accumulation unit (for example container, drip pad, tank, containment pad, or building).

e) The areas of the refinery with a higher potential for the release of feedstock, product, intermediates, and chemicals would be designed to contain any releases. For example, all of the process and rail car/truck loading areas would be paved with concrete surrounded by curbing. All of the process drains would be sealed and elevated above grade, with stormwater drains inside the battery limits mounted flush with grade. The hydrocarbon drains would be segregated and direct any hydrocarbon to a slop storage vessel and be returned to the process.

f) The storage tanks and tank farm would be constructed to minimize the potential for accidental releases of the materials stored in the tanks. The lower third of each tank would be double-walled, potentially including the floor (for additional leak prevention). The annular space between the two walls would be monitored on a routine basis for detection of hydrocarbon vapors via a portable hydrocarbon detection device. Additionally, each tank would be diked and the space inside the dike would have a geotextile liner. Each dike would be sized to hold the entire contents of the tank plus stormwater from a 100-year, 24-hour storm event (5 inches

g) The waste water treatment system (excluding surface impoundments for stormwater and treated wastewater), which would generate the major hazardous waste stream during normal operations, would consist of equipment that would meet the definition of a "tank" (non-earthen materials), as required by RCRA. The equipment, with the exception of the API Separator and holding ponds, would be located within a building (concrete floor and curbing). Leak detection and secondary containment would also be utilized.

h) All hazardous wastes shipped off-site for recycling or disposal would be shipped by experienced and licensed third-party transporters. Waste shipments would be tracked by the use of shipping manifests that would ensure that the waste was received by the designated waste handling facility. All waste would be packaged and labeled as required by applicable regulations.

i) All monitoring and reporting requirements under RCRA applicable to an LQG would be identified and strictly complied with.

j) Employees would be trained in pollution prevention techniques and that pollution prevention is everyone's responsibility.

k) The refinery would maintain a spill contingency plan for responding to any spills or releases of hazardous materials.

l) All underground piping would be double-walled.

m) Surface impoundments would be double-lined.

n) Container areas would be in curbed concrete areas .

o) An effective irrigation management plan that would be protective of human health and the environment should be designed and implemented as appropriate.

As can be seen, the design of the refinery, and the operational procedures that would be put in place, would considerably reduce the risks for any potential impacts associated with waste generation and handling at the refinery. The refinery would be relative small in size as compared to most existing U.S. refineries, and for reasons discussed previously in this report, would produce fewer wastes than conventional refineries. The waste management hierarchy that would be followed by the refinery, to the extent possible, would be a major factor in the reduction of risks to the environment, employees and public due to spills and releases of hazardous wastes.

Source Reduction (Most Desired)

Recycling

Treatment

Land Disposal (Least Desired)

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Appendix A

Typical Hazardous Waste Streams and EPA Hazard Waste Numbers with Potential for Generation at the MHA Nation's Refinery

Hazardous Waste Listings

Hazardous waste listings have been prepared by the EPA that describe waste from various industrial processes, wastes from specific sectors of industry, or wastes in the form of specific formulations (U. S. Environmental Protection Agency 2003a). The various listed wastes are found in the regulations of 40 CFR Part 261. There are four lists:

- K List, which designates as hazardous particular waste streams from certain specific industries such as petroleum refining. The K list wastes are identified as waste from specific sources (40 CFR 261.32). Examples of the K listed wastes for petroleum refining are shown on Table A–1.

- F List, which designates as hazardous particular waste from certain common industrial or manufacturing processes. Since these wastes may be produced in different sectors of industry, the F wastes are known as wastes from nonspecific sources (40 CFR 261.31). The list of F waste that be produced in petroleum refineries is presented on Table A–2.

- P and U Lists, which are similar, in that they both list as hazardous pure or commercial grade formulations of certain specific unused chemicals (40 CFR 261.33). Examples of P and U wastes that may be generated at petroleum refineries are shown on Tables A–3 and A–4.

Table A–1 Major Types of Listed Hazardous Waste With Potential for Generation at MHA Refinery

EPA Hazard Waste Code	Hazardous Waste Identification	Hazard Code
K Waste [Petroleum Refining]		
KO48	Dissolved Air Flotation (DAF) Float	T
KO49	Slop Oil Emulsion Solids	T
KO50	Heat Exchanger Bundle Cleaning Sludge	T
KO51	API Separator Sludge	T
KO52	Tank Bottoms (Leaded)	T
K169	Crude Oil Storage Tank Sediment	T
K171	Spent Hydrocracking Catalyst, including guard beds used to desulfurize feeds to other catalytic reactors	I, T
K172	Spent Hydrorefining Catalyst from petroleum refining operations used to desulfurize feeds to other catalytic reactors	I, T
F List (Spent solvents)		
F001	The following Spent Halogenated Solvents used in degreasing: tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; All spent solvent mixtures/blends used in degreasing containing, before use, a total of 10% or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	T
F002	The following spent halogenated solvents, tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	T
F003	The following spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, N-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one of more of the above non-halogenated solvents, and a total of 10% or more (by volume) of one or more of those solvents listed in F001, F002 and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	I
F004	The following spent non-halogenated solvents: cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, Foo2, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	T
F005	The following spent non-halogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002 or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	I, T

Table A–2 Major Types of Listed Hazardous Waste with Potential for Generation at MHA Refinery (F List Petroleum refinery wastewater treatment sludges)

EPA Hazard Waste Code	Hazardous Waste Identification	Hazard Code
F037	Petroleum refinery primary oil/water/solids separation sludge – any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oil cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to, those generated in oil/water/solid separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow, sludges generated in stormwater units tat do not receive dry weather flow, sludges generated from non-contact once-through cooling s waters for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in 40 CFR 261.3(b)(2) (including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and K051 wastes are not included in this listing. This listing does include residuals generated from processing or recycling oil-bearing hazardous secondary materials excluded under 40 CFR 261.4 (a)(13)(i).	T
F038	Petroleum refinery secondary (emulsified) oil/water/solids separation sludge. Any sludge and/or float generated form the physical and/or chemical separation of oil/water/solids in process wastewaters and oily cooling wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in: induced air flotation (IAF) units, tanks and impoundments, and all sludges generated in dissolved air flotation (DAF) units. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges and floats generated in aggressive biological treatment units as deined in 40 CFR 261.31(b)(2) (including sludges and floats generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units), and F037, K048 and K051 wastes are not included in this listing.	T

Table A–3 P Waste (Hazardous pure or commercial grade formulations of certain specific unused chemicals)

EPA Hazard Waste Code	Hazardous Waste Identification	Maximum Concentration (mg/L)
P005	2-Propen-1-ol (or) Allyl Allcohol	H[1]
P011	Arsenic oxide As_2O_5 [Arsenic pentoxide]	H
PO12	Arsenic trioxide	H
PO22	Carbon disulfide	H
P028	Benzene, (chloromethyl)- [Benzyl chloride]	H
PO29	Copper cyanide [copper cyanide Cu(CN)]	H
PO58	Fluoroacetic acid, sodium salt	H
PO98	Potassium cyanide [potassium cyanide K(CN)]	H
P105	Sodium azide	H
P106	Sodium cyanide	H
P120	Vanadium oxide V_2O_3 [Vanadium pentoxide]	H

Note:
1. H =

Table A–4 U Waste (Discarded commercial chemical products, off-specification species, container residues and spill residues)

EPA Hazard Waste Code	Hazardous Waste Identification	Hazard Code
U001	Acetaldehyde	I
U002	Acetone [2-Propanone]	I
U003	Acetonitrile	I, T
U007	Acrylamide	T
U012	Aniline	I, T
U019	Benzene	I, T
U021	Benzidine	T
U031	1-Butanol	I
U034	Acetaldehyde, trochloro- [Chloral]	T
U037	Benzene, chloro- (or) C``hlorobenzene	T
U043	Ethane, chloro-	T
UO44	Chloroform	T
UO52	Cresol (Cresylic Acid)	T
UO56	Cyclohexane	I
UO57	Cyclohexanone	I
UO70	o-Dichlorobenzene	T
UO71	m-Dichlorobenzene	T
UO72	p-Dichlorobenzene	T
U080	Methane, dichloro [Dichloromethane]	T
U105	2,4-Dinitrotoluene	T
U106	2,6-Dinitrotoluene	T
U108	1,4-Diethyleneoxide (or) 1,4-Dioxane	T
U112	Acetic Acid ethyl ester	I
U117	Ethyl ether	I
U122	Formaldehyde	T
U134	Hydrofluoric acid	C, T
	Hydrogen Fluoride [Hydrofluoric Acid]	C,T
U140	1-Propanol, 2-Methyl- (or) Isobutyl Alcohol	C, T
U151	Mercury	T
U154	Methanol	I
U159	Methyl ethyl ketone (MEK)	I, T
U161	4-Methyl-2-pentanone (or) Methyl Isobutyl Ketone (or) Pentanol, 4-Methyl-	I
U165	Naphthalene	T
U183	Pentachlorobenzene	T
U188	Phenol	T
U196	Pyridine	T
U201	Resorcinol	T
U208	1,1,1,2-Tetrachloroethane (or) Ethane, 1,1,1,2 – Tetrachloro-	T

Table A–4 U Waste (Discarded commercial chemical products, off-specification species, container residues and spill residues)

U209	1,1,2,2-Tetrachloroethane (or) Ethane, 1,1,2,2-Tetrachloro	T
U210	Ethene, Tetrachloro- (or) Tetrachloroethylene	T
U211	Methane, tetrachloro-	T
U213	Furan, Tetrahydro- (or) Tetrahydrofuran	I
U218	Thioacetamide	T
U219	Thiourea	T
U220	Toluene	T
U226	Ethane, 1,1,1-Trichloro- (or) Methyl Chloroform	T
U228	Trichloroethylene	T
U239	Xylene	I
U404	Ethanamine, N,N-Diethyl- (or) Triethylamine	T

Hazardous Waste Characteristics

Hazardous waste characteristics are used to indicate that a waste poses a sufficient threat to deserve regulation as hazardous (EPA 2003a). The four characteristics of hazardous waste used are the following:

- Corrosivity
- Ignitability
- Toxicity
- Reactivity

These characteristics and the test methods used to detect their presence are found in 40 CFR Part 261, Subpart C. Typical hazardous waste streams and EPA hazardous waste numbers that are identified as per these four characteristics are discussed below.

Corrosivity (Acids/Bases)

Acids, bases or mixtures with a pH less than or equal to 2 or greater than or equal to 12.5 are considered to be corrosive (40 CFR 261.22, Characteristic of Corrosivity) (U. S. Environmental Protection Agency 2005c). In addition, a liquid capable of corroding steel at a rate of ¼ inch per is corrosive. Strong acids and bases are examples of corrosive liquids. All of the corrosive materials and solutions have the EPA Hazardous Waste Number D002. Strong acids and bases are examples of corrosive liquids (Table A–5).

Table A–5 Examples of Corrosive Waste Streams

Acetic Acid	Perchloric Acid
Ammonium Hydroxide	Potassium Hydroxide
Nitric Acid	Sodium Hydroxide (Spent caustic)
Phosphoric Acid	Sulfuric Acid (Spent Acid)
Source: U. S. Environmental Protection Agency 2005c	

Ignitable Wastes

Ignitability is defined for different 7sources as follows:

- Liquid wastes with a flashpoint of 140^o F or less.
- Gases classified as ignitable compressed gases or oxidizers.
- Solid wastes if it can spontaneously catch fire and burn so vigorously that it creates a hazard.

Ignitable wastes have the waste code of D001.

Ignitable waste (i.e., flammable liquids, non-liquids and contained gases) with a flashpoint of less than 140^o F consist of materials such as spent solvents, certain spent catalysts, off-spec hydrocarbon products, ignitable paint wastes (paint removers, brush cleaners and stripping agents), and epoxy resins and adhesives (40 CFR 261.21) (U. S. Environmental Protection Agency 2005c). Some of the commonly used ignitable compounds include those listed on Table A–6.

Table A–6 Commonly Used Ignitable Compounds

Waste Stream	EPA Hazardous Waste No.
Acetone	F003
Benzene	D001
n-Butyl Alcohol	F003
Chlorobenzene	F002
Cyclohexanone	F003
Ethyl Acetate	F003
Ethylbenzene	F003
Ethyl Ether	F003
Ethylene Dichloride	D001
Methanol	F003
Methyl Isobutyl-Ketone	F003
Petroleum Distillates	D001
Xylene	F003

U. S. Environmental Protection Agency 2005c

Toxicity (Heavy Metals/Organics)

EPA uses a laboratory procedure called Toxicity Leaching Procedures (TCLP) to identify wastes likely to leach dangerous concentrations of certain known toxic chemicals into groundwater in the absence of special restrictions on its handling (U. S. Environmental Protection Agency 2003a). In order to determine whether a waste exhibits the toxicity characteristic involves two main steps: preparation of a leachate sample using the TCLP and evaluating the concentrations of the chemicals in the sample against established regulatory levels. A number of heavy metals and other inorganic waste materials are considered hazardous when they exceed established concentrations in 40 CFR 261.24, Table 1 (U. S. Environmental Protection Agency 2005c). Examples of such types of wastes include dusts, solutions, wastewater treatment sludges, paint wastes, and other such materials which contain heavy metals and inorganics. Some of the more common types of metals and their maximum concentration limits are shown on Table A–7. Oil sludge waste may be found to contain levels of benzene (D018) in excess of 0.5 mg/L and some refining catalysts may contain heavy metals (e.g., D006 Cadmium [1.0 mg/L] and D007 Chromium [5.0 mg/L]) in excess of maximum concentrations.

Table A–7 Toxicity Characteristic Constituents and Regulatory Levels of Non-Listed Hazardous Waste [D Waste]

EPA Hazard Waste Code	Hazardous Waste Identification	Maximum Concentration (mg/L)
D001	Ignitable Waste (I)	-
D002	Corrosive Waste (C)	-
D003	Reactive Waste (R)	-
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chromium	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0
D018	Benzene	0.5
D019	Carbon Tetrachloride	0.5
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D023	o-Cresol	200.0
D024	m-Cresol	200.0
D025	p-Cresol	200.0
D026	Total Cresols	200.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichloroethane	0.5
D029	1,1-Dichloroethylene	0.7
D030	2.4-Dinitrotoluene	0.13
D035	Methyl Ethyl Ketone	200.0
D036	Nitrobenzene	2.0
D038	Pyridine	5.0
D039	Tetrachloroethylene	0.7
D040	Trichloroethylene	0.5

Source: U. S. Environmental Protection Agency 2003a

Reactives

Reactive wastes consist of reactive materials or mixture which are unstable, react violently with or form explosive mixtures with water, generate toxic gases or vapors when mixed with water (or when exposed to pH conditions between 2 and 12.5 in the case of cyanide-or sulfide-bearing wastes), or are capable of detonation or explosive reaction when irritated or heated (40 FR 261.33) (U. S. Environmental Protection Agency 2005c). All reactive wastes have an EPA hazardous Waste Number of Doo3, unless otherwise specified. Some materials commonly considered to be reactive are listed on Table A–8.

Table A–8 Materials Commonly Considered to be Reactive

Waste Stream	EPA Hazardous Waste No.
Acetyl Chloride	D003
Chromic Acid	D003
Cyanides	D003
Organic Peroxides	D003
Perchlorates	D003
Permanganates	D003
Hypochlorites	D003
Sulfides	D003

U. S. Environmental Protection Agency 2005c

Solvents

There are a number of spent solvents, solvent still bottoms or mixtures that contain solvents considered as hazardous (U. S. Environmental Protection Agency 2005c). Such solvents include those used in degreasing and paint-brush cleaning, and distillation residues from reclamation. Some of the commonly used hazardous solvents are shown in Table A–9.

Table A–9 Commonly Used Solvents

Waste Stream	EPA Hazardous Waste No.
Benzene	D001
Carbon Disulfide	F005
Carbon Tetrachloride	F001
Chlorobenzene	F002
Cresols	F004
Cresylic Acid	F004
O-Dichlorobezene	F002
Ethanol	D001
Ethylene Dichloride	D001
Isobutanol	F005
Isopropanol	D001
Kerosene	D001
Methyl Ether Ketone	F005

Naphtha	D001
Nitrobenzene	F004
Petroleum Solvents (Flash point <140^{o}F)	D001
1,1,1-Trichloroethane	F001 (Sludges)
Tetrachloroethylene	F001 (Sludges)
Toluene	F005
Trichloroethylene	F001 (Sludges)
White Spirits	D001

Appendix B

Safety, Health, and Environmental Management System

The MHA Refinery would use a safety, health and environmental management system (SHEMS) to ensure safety, health, and environmental (SH&E) issues would be properly integrated into the refinery's day-to-day operating procedures. The SH&E management system would meet EPA and OSHA requirements and, would be used to assess potential operational risks and to maximize operational integrity, reliability and efficiency. Such management systems provide a systematic approach to SH&E management, based on a Plan-Do-Check-Act cycle, with the goal of continual improvement (U. S. Environmental Protection Agency 2004c):

- Plan actions (e.g., legal requirements and operating standards, including objectives, goals and strategic plans)
- Provide resources to Do them (implementation, training and operational controls)
- Check accomplishments (auditing)
- Act or adjust as needed to achieve refinery objectives (management review and acting to make needed changes in the SHEMS)

A well developed and implemented SHEMS can result in refinery business and SH&E benefits by improving SH&E performance, maintaining and improving compliance, preventing pollution and conserving resources, reducing and mitigating risks, increasing efficiency, reducing costs, enhancing employee morale, enhancing image with the public, regulators, lenders and investors, achieving and improving employee awareness of SH&E issues and responsibilities, and qualification for recognition and incentive programs such as the EPA Performance Track Program (EPA 2004).

Once the refinery has its approved final design and has sufficient information to identify facility equipment and operational activities that could interface, interact, influence or impact the environment as well as worker and public health and safety, the MHA Refinery would begin development of the SHEMS. There are a number of different elements used for SHEMS by various industries. Each facility can structure its own management system in a manner to address its particular goals, activities, budgets, missions, conditions and stakeholders (U.S. Department of Energy and U. S. Environmental Protection Agency 1997). The refinery would initially review various elements as to applicability, and would then select those elements determined to be of most value for improving SH&E performance and compliance. Examples of elements to be considered are presented in Table B–1.

The focus of the SHEMS would be on compliance with SH&E laws and regulations and SH&E performance that moves beyond compliance in both regulated and non-regulated areas. This is consistent with the focus of the Commission for Environmental Cooperation (governments of Canada, Mexico, and U. S.) in its guidance document on improving environmental performance and compliance in environmental management systems (Commission for Environmental Cooperation 2000) and EPA's Environmental Management System (EMS) Policy (Whitman 2002).

Table B–1 Example of Elements of a Safety, Health and Environmental Management System

SHEMS Element	Description
SH&E Policy and Leadership	A documented and clearly communicated HS&E policy that refinery management is committed to.
SH&E Risk Assessment	Assessment of potential SH&E impacts to the environment, employees, and the public through the life cycle of the refinery.
Legal Requirements and Operational Standards	A documented process to identify, interpret and implement applicable regulatory requirements. Also, a documented process for identifying, selecting, and communicating the refinery operating standards.
Objectives, Goals and Strategic Planning	A process for setting objectives, goals, and establishing work plans for accomplishing objectives and goals. Such goals, objectives, and plans should be consistent with policy, and result in continuous improvement.
Asset and Operations Integrity	Implementation of processes to ensure that integrity/reliability issues which have the potential to cause a SH&E impact are properly considered at all stages in a project's life cycle. This would include issues likely to result in a loss of containment or injury.
Programs and Procedures	Establishment of SH&E programs and procedures to address hazard/risks, regulatory requirements and operating standards identified in the Planning elements. Such programs and procedures identified, documented, and made available to employees and contractors.
Structure and Responsibility	Definition and documentation of roles, responsibilities, accountabilities and interrelations necessary to implement the SHEMS and facilitate SH&E management. Effective means of communication in place.
Training and Education	A documented training program that provides employees with the necessary skills and knowledge to perform work in a safe and environmentally sound manner.
Communication System	Processes in place for internal communication of SH&E issues effectively and receiving and responding to public inquiries.
Documentation and Document Control	Process or procedure for maintaining SH&E related documents and records in accordance with refinery policy.
Emergency Preparedness and Crisis Management	A process for identifying and reviewing potential emergency situations and then planning for mitigation and control of incidents. Emergency response Plans maintained which address potential situations requiring emergency actions.
Audits	Performance of periodic audits focused on compliance and the SHEMS.
Performance Measures	Process for tracking performance measures that reflect key characteristics of the refinery operation and it's SH&E impacts. Measures to be used to improve performance.
Management Review	Periodic management review of SHEMS effectiveness. Results of review used as a basis for leading continuous improvement.

Appendix C
Response to Spills and Releases

Spills and releases are part of the reality of operating a petroleum refinery. Even with engineered spill and release prevention features and stringent operating procedures at the refinery, the potential would still exist for releases of oil, hazardous wastes, and listed hazardous substances at the refinery that could pose as a potential risk to the environment and human health. The MHA Refinery would develop plans to minimize the risk and impact of unplanned spills and releases of oil and toxic and hazardous substances during construction, commissioning, and operation.

Spill and release response and reporting is regulated by federal and state laws, including the following:

- Oil Pollution Act of 1990 (OPA 90);
- Resource Conservation Recovery Act (RCRA);
- Clean Water Act (CWA);
- Clean Air Act (CAA);
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA);
- Emergency Planning and Community Right to Know Act (EPCRA), a stand alone provision of Title III of the Superfund Amendments Reauthorization Act (SARA);
- Hazardous Materials Transportation Act (HMTA); and
- Occupational Safety and Health Administration (OSHA) requirements.

A Spill Prevention, Control and Countermeasure ("SPCC") plan and a Facility Specific Response Plan (FSRP) under OPA 90, a Hazardous Waste Contingency Plan (HWCP) under RCRA, a SARA Title III Emergency Plan, a HMTA Response Plan (as applicable), and, if threshold "trigger" quantities are exceeded, a CAA Risk Management Plan, would be prepared for addressing any potential unplanned releases of regulated materials. An alternative to these multiple plans would be to develop a single comprehensive plan that would be properly constructed and implemented so as to meet the requirements of these plans, which would help to simplify refinery response requirements.

The refinery would be required to report a release or spill of oil or hazardous substances that exceed reportable quantities to a federal and/or state agency, depending on the area of release (i.e., on or off tribal land) when the amount reaches a state or federally determined limit. Specific reporting requirements have been established for hazardous substance releases and oil spills that determine when spills and releases must be reported. State and federal agencies typically have separate reporting requirements, depending upon the established jurisdictions (U. S. Environmental Protection Agency 2004b). The refinery would respond to the appropriate agency, as required by law. Spill reporting procedures would clearly define the rationale for agency reporting requirements.

Under Alternative 1, the facility would be classified as a RCRA facility and would require a RCRA TSD permit under 40 CFR Parts 264 and 270 due to the use of the upstream holding pond (surface impoundment) in the WWTU that accumulates hazardous waste sludges (F037) and / or does not meet the definition of a tank or tank system under the WWTU exemption.. The upstream holding pond would accumulate FO37 and would be classified as Hazardous Waste Management Units (HWMU). All HWMUs would be subject to to RCRA permit requirements under 40 CFR Part 264, including: Subpart D- Contingency Plan and Emergency Procedures, Subpart F- Releases From Solid Waste Management Units (including groundwater monitoring and contamination response and corrective action requirements), Subpart G- Closure and Post-Closure, Subpart H- Financial Requirements, Subpart J- Tank Systems, and Subpart K- Surface Impoundments (design, construction, operation, etc.). In the event of a release from the holding pond, the refinery would be required to follow applicable permit requirements and, follow EPA guidance on RCRA corrective action (U. S. Environmental Protection Agency 2005dc). The requirement for corrective action and site cleanup would also extend to releases from any solid waste management unit (SWMU) at the facility, not just the holding ponds (40 CFR Part 264.101). It includes the requirement to cleanup releases of hydrocarbons or other contamination to soils and groundwater onsite and offsite that are related to facility operations. Therefore, the entire facility and all offsite areas where contamination may have migrated become subject to RCRA corrective action under a RCRA permit. EPA's RCRA Corrective Action Program generally requires, and provides guidance for, the investigation and cleanup, or remediation, of any releases of hazardous waste or hazardous constituents to all environmental media from all Solid Waste Management Units (SWMUs) -at RCRA permitted TSD facilities (U. S. Environmental Protection Agency 2003b). Also, if the HWMUs were not clean-closed at the end of operations, a RCRA post-closure permit would be required.

Under Alternative 4&A, the facility would not be classified as a RCRA TSD. The facility would be classified only as a RCRA generator. This is due to the fact that tanks are used in the WWTU instead of holding ponds (surface impoundments). The facility would be required to meet the applicable requirements for generators under 40 CFR Part 262, and 265 which include responses under a HWCP as per 40 CFR Part 265.52 for spills and releases. There would be no requirements, however, for financial assurance, groundwater monitoring, or corrective action.

Other alternatives that do not qualify for the WWTU exemption would require a RCRA TSDF permit.

Emergency Action Plan

An SPCC Plan, FSRP, HWCP, SARA Emergency Plan and, as applicable, a CAA Risk Management Plan and HMTA Response Plan, would be an integral part of the refinery's Emergency Action Plan in responding to releases of oil and hazardous substances. The plan would provide for an organized response to incidents and emergencies to protect the environment, employees, and public. Emergency Response Team members, as well other designated refinery staff members, would be properly trained in the plan requirements and spill/release response and cleanup techniques and procedures. Periodic mock spill drills would take place as part of the on-going spill response training process.

The objectives of the emergency response plan for spills or releases would be:

- to describe the responsibilities and required actions of each individual working for the refinery in the event of an environmental incident or emergency;
- to describe actions to be taken to minimize the effects of an environmental incident or emergency on personnel, equipment and the environment; and
- to describe the internal and external communications necessary in the event of an unplanned spill or release.

On-Site Incidents

Minor spills and releases would typically be contained and managed by refinery personnel assigned to a specific work area, as long as they were not exposed to significant risks, e.g., hydraulic fluid leak from machinery. Such actions typically would not require the assistance of emergency response personnel. For major spills or releases, such as a significant release of crude oil or product material such as diesel, the refinery's Emergency Action Plan would be activated, with the Emergency Response Team responding. These team members would be trained in spill response measures. As required, the Emergency Response Team would obtain the assistance of refinery operations and maintenance staff in obtaining information on the type and quantity of spilled material, shutting down or moving equipment as needed, acquisition of equipment and supplies, and providing access to areas where entry is needed to respond to the spill or release. If an emergency release exceeded the capability of the response team, or posed as an unacceptable safety risk, assistance would be requested from professional spill response specialists and contractors and the appropriate local, state, and/or federal environmental agencies.

Off-Site Incidents

Typically, all minor or major off-site spills or releases would be responded to by members of the Emergency Response Team. Assistance from maintenance or operations personnel may be required for providing information on the spilled material, acquisition of equipment and supplies, and assisting with containment at the source of the spill or release. Only trained personnel would be allowed to participate in any cleanup activities with the potential for exposure.

If any spill or release is significant enough that exceeded the capability of the Emergency Response Team to adequately respond, assistance would be requested from professional spill response specialists and contractors and the appropriate state and federal environmental agencies.

In general, emergency response procedures would occur as shown in Table C–1 (SRK Consulting 2005).

Table C–1 Emergency Response Procedures

Spill or Release Incident

Emergency Response Procedures Initiated

- First Responder reports spill/release and notifies supervisor.
- Stop release immediately if it can be done safely.
- Supervisor notifies Operations/ Manager responsible for area that the spill/release occurred in and Environmental Manager.
- Environmental Manager contacts refinery Emergency Response Team Lead at direction of appropriate Area Manager.
- Environmental Manager and Emergency Response Team Lead gather Information as to the spill/release.
- Preliminary information is completed on incident report form.
- Information conveyed to the Emergency Response Team Lead & members.
- Emergency Response Plan activated.
- Emergency Response Team dispatched to area of spill/release.
- Environmental Manager notifies applicable local, state and federal agencies, as well as other potentially affected parties (e.g., off-site entities) as to ongoing events and issues. If a release exceeds the "reportable quantity" of toxic hazardous substances, CERCLA and/or RCRA notification required. The Local Emergency Coordinator must be notified if an "extremely hazardous substance" is released that results in exposure of persons outside the boundaries of the refinery.
- Acquire additional response units/personnel as necessary.
- National Response Center phone number: 800-424-8802

Spill/Release Cleanup Initiated

- Spill or Release material is contained and/or release is controlled.
- Identify and estimate quantity of substance spilled or released.
- As required, off-site specialists/contractors are contacted and assistance requested.
- Contaminated materials are removed and temporarily secured.
- Arrange - for proper disposal of any contaminated material.
- Incident report form is completed by Supervisor.

Follow-up and Reporting Procedures Initiated

- Notify agencies of results of spill response and report as per reportable quantity requirements.
- Conduct debriefing following response actions.
- Evaluate emergency response procedures and modify as necessary.
- Schedule a drill to incorporate major response modifications.